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We Must Make Headway

IN our national determination last year to set our house in order we became so drastic in some of our economy measures that we made the depression in industry worse than it already was and worse than it need have been. In the atmosphere that then prevailed, it would have been wonderful if we had not made some mistakes; but we must not perpetuate past errors.

The protests that were made in these columns against the disposition of local authorities to make what were actually false economies will be in readers' minds as they read the statements made at the meeting of Johnson & Phillips, Ltd., by Mr. Leslie Wates, the chairman, and by Sir Philip Dawson, M.P., a director.

In the experience of the company mentioned, business which had shown a falling-off in private orders late in 1930 showed improvement in the spring of 1931, but this accession of such orders did not continue, and "the general depression which persisted was made worse by the wave of economy and stringent cutting down of expenditure by Government Departments, local authorities, and other large corporations." It seemed to some of us then, as it seems to more now, that it would have been far better if more emphasis had been placed on wise spending than on not spending. To electrical manufacturing companies who look more than most others to local authorities and Government Departments for work, this mistaken economy was a very important matter, and it is reflected in the results now being laid before shareholders—reduced profits and dividends which, of course, mean less money receivable by the State in the form of taxation at a time when it sorely needs all that it can get.

For local authorities to cease, or unreasonably to defer, expenditure upon electrical undertakings, when it has been practically certain that the outlay would be revenue-earning, was, and is, as we have repeatedly said, quite short-sighted policy. Municipal councillors who think that they are serving the best interests either of the State or of the ratepayers by neglecting the development of their systems have fallen into a grievous error.

If any service of a public kind justifies the adoption of a policy of free and full expansion at the present time it is that of electricity supply for domestic and power purposes. True it is that the spending power of the public has contracted, but there *must* be light and power in the home and in the business, and the tendency is for the individual householder to increase his supply, while no figures need be quoted here now to show that new consumers are continually coming on to the mains.

When the spending power of the community returns to normal, that will be an acceptable additional factor still further stimulating demand. It is almost farcical to contemplate a Central Board (a Government Department) holding a sword of Damocles over the electricity supply industry urging it to develop its sales more rapidly, while responsible local authorities stay their hands in the belief that they are serving the best interests of the nation and of their ratepayers!

Sir Philip Dawson stressed Mr. Wates's point by saying that the spending of money upon revenue-earning things should be encouraged because ultimately it meant more work, less unemployment, and the placing of industry in a better position to "carry on" and to compete in the markets of the world.

More Power Station Extensions

THE starting up of a 15,000-kW extension at Plymouth on Tuesday and of a further 30,000 kW at Hackney later in the month comes as a reminder that the future still offers plenty of scope for power station developments. In the larger sizes technical progress should be more rapid than ever. Thus for the boilers at Hackney, automatic control has been developed to a greater extent than at any other British station—more so even than at Kirkstall, which was described in our issue of March 27th, 1931. Even sudden fogs will be coped with without human aid, a feature that, so far as we can ascertain, is unique. The output from public supply undertakings shows every sign of acceleration; if this happens in existing circumstances, the chief danger seems

to us to lie in not having enough efficient plant to meet the requirements of the public when normal conditions return. This might easily happen without adequate warning, as large plant cannot be built and installed within a few weeks, but we look to grid interconnection, which is expected to be completed next year, to guard us from the consequences of plant shortage in certain localities.

Our Overseas Hopes

CANADA and Australia both interest the British electrical exporter, though the former in the past has yielded far less work for our factories than has the latter. All overseas markets count, but the Empire most of all. In a speech delivered last week Sir Philip Dawson found grounds for hope that the forthcoming Ottawa Conference would lay a sound foundation for Imperial economic unity and in time bring a return of prosperity. No doubt our electrical manufacturers' association is already preparing for Ottawa and an F.B.I. Committee has just issued a report on matters which should be considered there. With regard to Australia, the effect of the disturbed situation there has been felt more or less seriously by most British electrical exporters, and different companies have adopted different courses in dealing with losses on exchange, either writing them off from profits or leaving their money in the bank until the position is a little clearer. It is satisfactory to hear an electrical authority expressing the definite opinion that Australia is now on the high road to financial recovery. We may justly feel that there is great hope for the electrical industry of this country if Canada becomes the big purchaser that she might be and Australia resumes the large calls that she has hitherto made upon us.

From Pole to Pole

WITH due modesty we may be permitted to direct attention to a letter appearing in our Correspondence Columns to-day from Mr. Arthur Gook, the British Vice-Consul at Akureyri, Iceland. This is one of the many reminders lately received that in these days of world-wide disturbance the ELECTRICAL REVIEW is as strong a link as ever between British electrical manufacturers and traders at Home and buyers in distant markets. In our issue of February 12th (p. 234) the Vice-Consul asked us to acquaint the trade with the fact that he had received inquiries for the names of British firms supplying small direct-current dynamos. Details of actual requirements were given, also useful information regarding Continental prices. To-day he reports the receipt of a large number of replies, and says that appropriate action has been taken from which business should result. The electrical industry is indebted to Mr. Gook for his zeal on its behalf. In last week's "Correspondence" we published an inquiry received from a firm at Bucaramanga, Colombia, South America, asking to be put into touch with makers of certain electrical instruments.

Fourth-dimension Vectors

How cumbrous would the treatment of alternating-current problems be without the use of vectorial geometry! Above the base line on a two-dimensional plane, such problems are easy enough; below we come into the region of the operator, j—the square root of minus one—which is becoming difficult. Three-dimension vectors are, however, conceivable, but Kaluza would not be satisfied with less than five. Happily Dr. Einstein has now reconciled Kaluza's theory on electro-dynamic grounds with the (by now) comparatively familiar concept of the fourth dimension. In view of the shadow under which the first law of thermodynamics lies and the growing appreciation of the relation between new electrical developments and physics, it may be that our students of the future will come to regard vectors in a fourth dimension as part of their theoretical studies.

Oil Competition

DEVELOPMENTS in electrical heating plant for industrial uses cause us to have some sympathy with the complaint of the National Gas Council regarding the competition of fuel oil in large heating installations. The Council has pointed out to the Parliamentary Joint Committee, which is considering the Gas Undertakings (Power of Investment) Bill, that gas is handicapped, in relation to oil, because it is not able, under statutory powers, to pick and choose its consumers, and to make only such contracts as may be profitable; the same applies to electricity. The principle of protecting authorised undertakings from statutorily irresponsible competition, and also from unproductive expenditure resulting from competition with gas or any other form of energy, has been recognised in the Electricity Supply Acts. But these are merely passive measures. For the more positive aspect of securing new load in the teeth of competition, we know of no substitute for merit, and skilful insistence upon merit.

The Quarrying Industry

AMONG the many interesting matters touched upon in the speech of Mr. H. A. Vernet at the annual meeting of the British Power & Light Corporation (1929), Ltd., was the position of two sections of the quarrying industry in North Wales. The reduction of road-making activities on the part of public authorities is responsible for a falling-off in the granite-quarrying industry; the less active trade is now being felt in the reduced consumption of electrical energy therefor as compared with a year ago. On the other hand, the slate-quarrying industry is doing better than it was, because the depreciation of sterling and our national protective policy have reduced the severity of foreign competition. The general and domestic consumers in the area showed a very satisfactory advance last year both numerically and in the consumption by existing customers.

I.E.E. Subscriptions

ALTHOUGH not one of the most important subjects dealt with at the I.E.E. general meeting, the decision to reduce members' subscriptions from the beginning of next year will probably be of the greatest interest to the greatest number. The reductions will bring the amounts payable back to the pre-war level—that is, to the minimum figures allowed by the bylaws. Full members will benefit most by the change, but then the increase was greatest in their case.

Lightning and Aeroplanes

THE damage to the air-liner *Horatius* last Monday was not the first that has been caused by lightning to an aeroplane, but it emphasises that the danger point is the wireless aerial. The lightning appears to have jumped the arrestor and to have discharged into the wireless equipment, which was destroyed. One explanation advanced for the relative immunity of the aeroplane body from the effects of the stroke is that it is constructed of duralumin, which has a relatively high resistance. In view of experience of the erratic paths taken by high-frequency lightning discharges, we should not attach too much importance to ohmic resistance as a factor in the selection of alternative paths.

Further Improvement

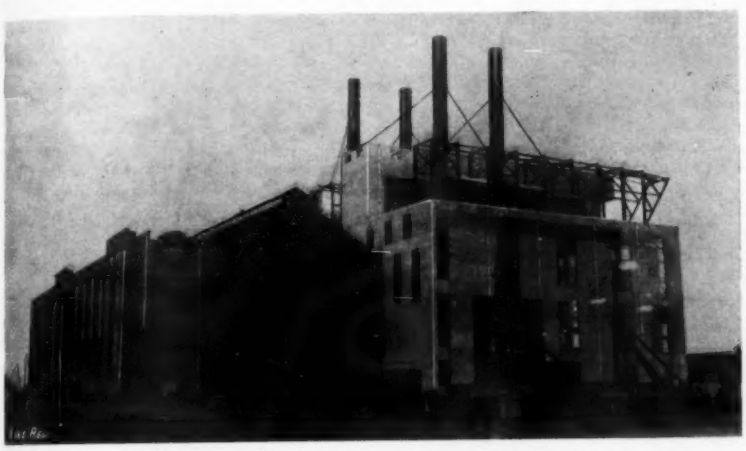
THE returns of the Electricity Commissioners relating to kWh generated in April (987 million) show an increase of 13.7 per cent. over the figures for April of last year. This is distinctly gratifying in all its implications. This spurt has brought the total increase for the first four months of 1932 up to 7.6 per cent. over the 1931 figures, the kWh generated having been 4,372 million. A continuation of the same order of progress should bring the total for the year up to the 10 per cent. at which we should aim as a minimum.

Spondon Power Station

Results depend finally on sound operation

A VISIT to the Spondon power station of the Derbyshire and Nottinghamshire Electric Power Co. gives one an impression of unusual spaciousness; indeed, we cannot recall an electricity works in which this feature is so predominant. In the turbine-room basement (22 ft. high) there is very ample clearance between the ends of the existing sets and the building side wall; the floor dimensions of the turbine room are 250 ft. by 78 ft., and in the extended portion in which the new 30,000-kW set is nearing completion the space seems even more ample.

Between the two existing boiler houses a 27-ft. gap provides excellent accommodation for the 4,000-gallon per hour Neckar,



Exterior of the station showing new boiler house

continuous blow-down water-softening plant, hotwells, etc., at the ground level, and the boiler-house service sub-station at the turbine-room operating-floor level; on the firing floor, in the ash basements (16 ft. high), and in connection with the coal-handling plant, switch-gear, and bus-bar equipment, one gets the same impression.

The governing considerations in laying out the plant on these lines are the provision of ample room for alterations, &c., and the maximum facilities for efficient operation. The company realises that station results depend in the long run on sound operation. The installation is an excellent example of all-British plant.

Coal Handling

Coal is purchased as three-quarter slack, and as fired it has a calorific value of from 10,000 to 11,000 B.th.u. per lb., with ash content averaging from 12 to 15 per cent. The fuel is received by the company's own siding from the L.M.S. main line, running parallel with the boiler houses on a gantry 16 ft. above ground level, and it is dropped from bottom-door wagons into a long bunker with a present capacity of 2,000 tons.

Controlled by valves in the bunker bottom, the coal is lowered on to a tipping-tray conveyor running the whole length of the bunker, some 250 ft., from which it is transferred to gravity bucket conveyors and elevators arranged normally to a main conveyor and serving the boiler houses—one forty-ton-per-hour equipment for No. 1 boiler house, two similar systems for No. 2 house, and two under construction for the third house, with provision for a similar pair in the last case. Simplicity is the keynote of the whole coal-handling installation.

Some 350 tons of coal is consumed per day, providing for the generation of up to half a million kWh. Actually the consumption works out at from 1.37 to 1.5 lb. of fuel per kWh. The maximum load on the plant last winter was over 38,000 kW, and the thermal efficiency of the station is about 23 per cent. It is considered that the site facilities should permit extensions of the station up to a total capacity of about 150,000 kW.

Boiler Equipment

The first boiler house has six Babcock & Wilcox c.t.m. 35,000-lb.-per-hour boilers, with Green superimposed economisers, fed from three 150-ton overhead coal bunkers. One 90-ft. shaft serves each line of three boilers, and induced draught only is employed. A pair of fans, each of which will take the whole duty, serves each boiler line.

Two rows of 40,000-lb. boilers in No. 2 house are fired under balanced draught in conjunction with Babcock & Wilcox tubular air preheaters arranged in the boiler structures at the back. The Babcock & Wilcox compartmental chain-grate stokers are motor driven through eight-speed gearing. "Liptak" suspended firing arches are a feature. A particularly useful instrument is a Hopkinson critical steam-pressure gauge which indicates the slightest load change before the ordinary meters. In this case there is a stack to each boiler, while the whole equipment is served by four 150-ton bunkers.

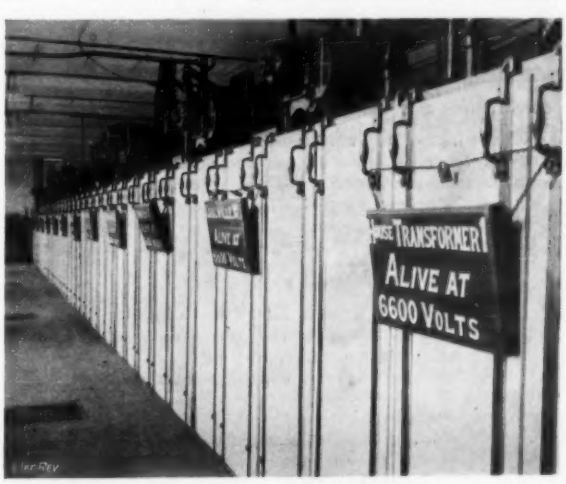
A notable feature of the new boiler house (No. 3, under construction) is that the fan floor is actually the building roof, the induced-draught fans, in each case with the Davidson grit arrestor, being outdoors, except for light structures for the protection of the operators. The chimney bases are actually on the roof, and the respective heights to the tops of the roofs, bunkers, and the stacks are 90, 110, and 150 ft.

The building is designed to accommodate eight 80,000-lb. boilers, four of which are being erected at present. They have a two-hour rating of 100,000 lb. per hour. Fitted for chain-grate firing, with one-pin links on the stokers and eight-speed driving gear, the boilers are suitable for conversion to pulverised fuel firing if required. Bailey water-cooled walls are being installed, and each unit is arranged with the economiser (return bend) sandwiched between the vertical tubular air preheater and the boiler at the back.

Heating surfaces for the boiler proper, economiser, air heater, and superheater are 8,821, 4,486, 18,434, and 2,262 sq. ft., respectively. The 20-deck superheater has provision for an increase of surface.

Each boiler has its own shaft and is equipped for balanced-draught operation, the forced-draught fans in the basement being fitted with hydraulic couplings for fan-speed regulation. Under natural draught an output of 50,000 lb. per hour is specified for each boiler. The induced-draught fan will afford a water gauge of 5½in. and has a capacity of 66,000 cu. ft. per minute. A 14-h.p. fan is to deliver hot secondary air above each grate.

The specified temperature of the preheated inlet air to the furnace is 280° F., and the gas outlet temperature from 260° to 280° F., based on an ambient air temperature of



General view of switchroom

80° F. The guaranteed normal and overload efficiencies of each boiler are 88.3 and 86.75 per cent. respectively. Diamond soot blowers and screw conveyors for removing dust and soot from the boiler baffles are interesting accessories, while the provision of Weir contraflow feed-water regulators is believed to be quite a new departure for land-type boilers. For each boiler house there are in the turbine room two Venturi water meters, one connected to the main and one to a junction with separate connections to each boiler.

The Generating Plant

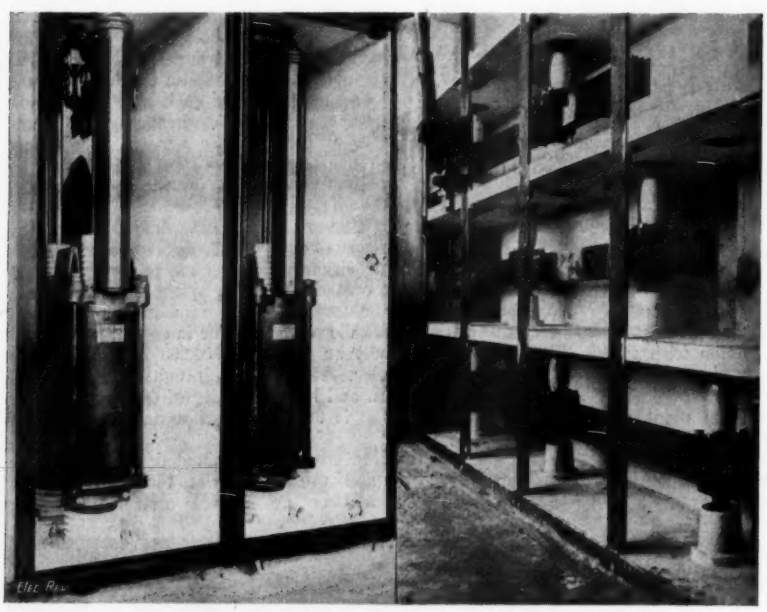
All told there are six B.T.-H. impulse-reaction turbo-alternators in the turbine room—two 6,000- one 12,000-, one 15,000-,

and one 25,000-kW existing sets, and the new 30,000-kW set. The three smaller ones run at 1,500 r.p.m. and have steam conditions of 225 lb. per sq. in. and 680° F., and the larger ones run at 3,000 r.p.m. and operate with steam at 350 lb. per sq. in. and 700° F. The older boiler-house installation is designed for steam generation at the lower pressure, and the others at the higher pressure, and the two sections are connected through a reducing valve.

The following interesting comparison illustrates the advance in turbine design during the past dozen years or so. The steam consumption for each of the 6,000-kW sets is 11.15 lb. per kWh, and that for the 25,000-kW set is 9.41 lb. per kWh. The 25,000- and the new 30,000-kW turbines are twin-cylinder and the others single-cylinder machines. Steam extraction for feed-water heating is effected from the 15,000-, 25,000-, and 30,000-kW machines—at one, two, and three stages, respectively.

Periodically kerosene is injected into each turbine steam chest, with the steam just before a stop, and corrosion is reduced considerably in this way. Oil purification for the first four turbo units is effected by Bowser equipment, for the 25,000-kW set by De Laval centrifugal plant, and in conjunction with the new set there will be a Hopkinson centrifugal purifier.

All the turbines are equipped with Worthington-Simpson surface condensers. The water-to-steam ratio of the 25,000-kW set is 44 to 1, and for the 30,000-kW set 54 to 1. The difference is because higher vacuum requirements on higher river-water temperatures had to be met in the second instance. The average vacuum obtained is 29.0 in. with water at 60 deg. F.



Construction and housing of main switches **The main bus bars**

Each set is operated entirely as a separate unit and, except for the two largest sets, with its own circulating pump in the basement, but there is a circulating-water bus main common to all.

The Water Supply

The 25,000- and 30,000-kW sets have twin condensers, and the smaller of these sets is served with circulating water from a pump house equipped with two 200-h.p. B.T.-H.-Allen vertical motor pumps—13,000 g.p.m. each—arranged with rotary screens on the delivery side of the pumps. For the new set a second pump house is being built, which will be similarly equipped. Each of the condensers of the new set has a cooling area of 15,000 sq. ft. The weight of the two condensers complete is 95 tons, and they have a friction head of 12.5 ft.

For all the smaller turbo-alternator units the circulating water is taken directly from a flume immediately adjacent and parallel with the turbine room, which is fed from the river through two chain-driven circular screens in the river wall. In an annexe to the pump house is a Paterson chlorinating plant (one part of chlorine to a million parts of water).

On the larger sets the circulating-water valves are electrically controlled. There are duplicate extraction pumps on all except the two smallest sets, and in each case one pump will take the full load. A W.S. rotary spinner air ejector, in which spinning water forms air pockets for discharge, serves each of the 6,000-kW sets, and for the 12,000- and 15,000-kW sets there are steam air ejectors in which the condensate is pumped through the ejector coolers. Air ejection for the two largest sets is also effected by Worthington Simpson equipment.

In the condenser basement from the original end of the station there are, in the following order, two Weir steam turbine-feed pumps for the low-pressure boiler house; two converted steam-to-electric feed pumps, which can be run singly for the low-pressure equipment or in series for the high-pressure boilers; and a most interesting 35,000-g.p.m. Weir turbo-electric combination pump for the 350-lb.-sq.-in. boilers. This combines the flexibility of steam with the high efficiency of electric working. The two sections, steam and electric, work in series, the speed of the B.T.-H. driving motor being constant (1,480 r.p.m., 320 h.p.), and the turbine speed variable.

The discharge-water pressure controls the steam governor, and the following are the speeds on the steam side at various loads: one-eighth load, 1,920 r.p.m.; half, 2,200; full, 3,130; and 10 per cent. overload, 3,460 r.p.m. The safety governor is set to trip at 6,000 r.p.m. The maximum output of this pumping set is 50,000 gallons per minute, and it will provide for 50,000 kW of load. A duplicate steam-electric set is to be included in the present extensions.

The alternator construction throughout the station is fairly standard practice, with various stages of progress marked in the later sets. The more modern fabricated construction has been adopted for the 25,000-kW and the new sets, and in each of these cases the laminations and windings have been put in on site. At the time of our visit the coil-end connections were being electrically brazed.

The two largest alternators are cooled on the enclosed-air, water-cooled system, the air being circulated by a separate fan coupled to the main shaft. Generation is at 11,000 V, 3-phase, 50 cycles.

Switch and Control Gear

The generator and feeder switches are all of the B.T.-H., O.H. 25, remotely controlled, motor-operated type, installed in stone cells, back to back, having capacities varying from 1,200 to 3,000 A, and with rupturing capacities of 750,000 kVA. There are also bus-bar couplers of 2,000-A capacity, and new 4,000-A switches are being installed. Each phase has a separate compartment to itself. The main contact is made in air, and the arcing contact (first to make and last to break) is made in oil. There are twenty-nine switches all told. The generator rheostats, cell-housed in the same room, are motor operated from the main control panels.

The bus-bars are immediately below the switches and are of similar cell construction. The isolating links are arranged at the top, with a common pin through the dividing wall (back to back).

A feature of the general lay-out of the station is the arrangement of the control and switch boards on the same level and only a few feet apart. The generator control board is entirely separate from that for the feeder switches.

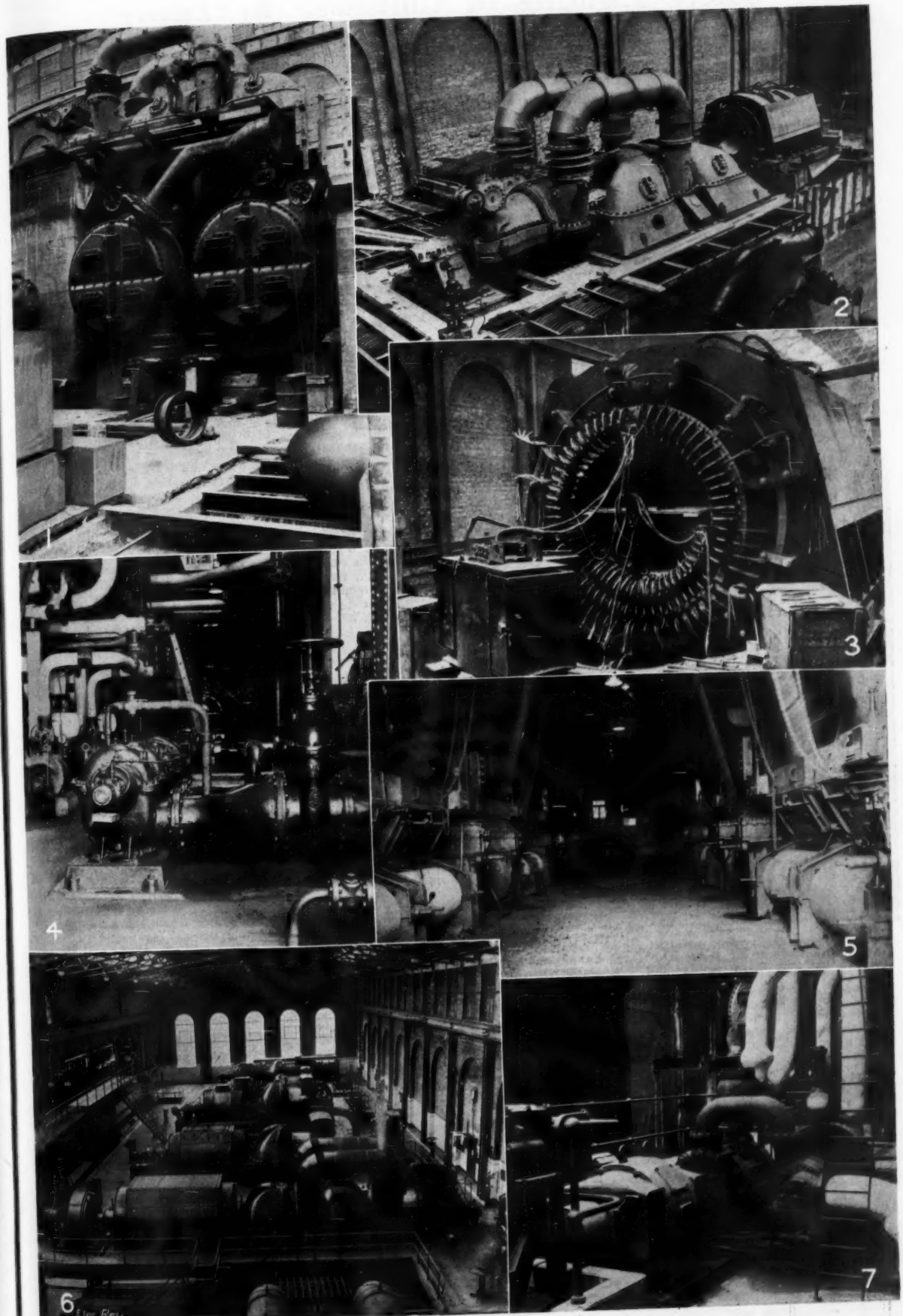
For each generator there are two panels, one equipped for voltage regulation (Tirrill) and the other devoted to switching. To facilitate emergency handling, the board is in two separate sections. The board includes a pair of panels (one feeder) for the Central Electricity Board's connection. The station frequency is controlled by a Warren clock.

The main control for the Central Electricity Board substation (132 and 33 kV) is to be effected from the power station, and the control board for this purpose is erected on the same gallery as and in line with the machine control board.

On the turbine floor are the feeder-control panels in two separate boards, also for ease of control in emergency. In both cases, generator and feeder, the two sections are normally electrically connected. At the ground level there is a local supply sub-station equipped with a 2,500-kVA transformer bank. In this " sub " there are two truck-type switches, with a step-up feed to 1,000 V, which are used for the control of new lines during the load-development period.

A station 400-Ah, 110-V Chloride battery for supplying current to the protective gear, switch-operating circuits, and works emergency lighting is served by a couple of 20-kW B.T.-H. motor-generator charging sets.

We are indebted to Mr. A. D. Phillips, manager of the Derby and Notts Co., for permission to view the works and to take photographs, and to various members of his staff for their assistance in the collection of the above information, and we heartily congratulate the company on a sound engineering job.



Some Views of the New Spondon Plant

1. The 30,000-kW set from basement level. 2. The new turbo-alternator from the control gallery. 3. Alternator stator; left, auto-transformer set for brazing coil end connections. 4. Condenser basement from original end of station; front right, c.w. pumps for 6,000-kW set; front left, steam feed-water pumps for l.p. boilers. 5. Firing floor of No. 2 boiler-house. 6. General view of existing plant from crane. 7. Steam-electric combination feed-water pump—50,000 gal. per hour (max.).

Safety Lighting in Cinemas. By "Battery"

THE sudden plunging into darkness of a normally lighted building is more than usually dangerous when—as in a cinema—a large gathering of people is seated in semi-darkness and in a condition of nervous tension or entire relaxation, depending on what appears on the screen. The nervous strength of the audience is that of its weakest member, who communicates fear to others which may rapidly give rise to a general state of panic.

The statutory regulations of July 30th, 1923, made under the Cinematograph Act, 1909, contain the following clause relating to safety lighting:—

"... The auditorium and exits therefrom to the outside of the building and all parts of the building to which the public is admitted shall throughout be adequately illuminated during the whole time the public is present. The lighting for this purpose (hereinafter referred to as safety lighting) shall be supplied from a separate source from that of the general lighting of the premises and shall not be controllable from the enclosure."

A footnote to the clause adds:—

"... If the general lighting is by electricity, the safety lighting shall be: (*a*) electricity from another source; (*b*) gas; or (*c*) oil or candles."

As the safety lighting has always to be visible while an audience is in the building, and a naked flame would be out of accord with modern ideas of decoration and of safety, (*b*) or (*c*) under the Regulations are ruled out as alternatives to electricity.

The regulation regarding alternative "(*a*) electricity from another source" has sometimes been interpreted to mean only

A novel system of lighting installed for an important conference held recently at the Metropole Hotel, London. Specially designed G.E.C. pendant units and artificially illuminated windows are used

that there shall be: (1) two complete and distinct systems of electric lighting from separate companies; or (2) electricity supplied by one company through two separate systems of mains to the exclusion of any independent electrical generating or storage plant. This is not the intention at all. There are not often two separate supply companies in the district to enable (1) to be complied with; even where there are it is possible for both supplies to be affected by one cause of breakdown. One of the leading local authorities has already pointed out to the owners of theatres, cinemas, &c., in its area that where two independent sources of supply are obtained from separate street mains an explosion in a manhole of one supply is liable to affect the other. There is very little safeguard in having two sets of mains to comply with (2) as a breakdown in the power station itself will render both mains useless.

The intention of the Act is that the safety lights should be supplied from a source entirely independent of the main supply and that in emergency the secondary system should be absolutely certain in operation.

L.C.C. Amendments

The Entertainments Committee of the L.C.C. has recently recommended certain amendments to the regulations governing cinemas; these include a provision that one of the two independent systems of lighting shall be a self-contained system installed on the premises. If this amendment is adopted, neither electricity from a public supply nor coal gas will be accepted as an independent system of lighting. Many authorities recommend the use of a storage battery subject to certain stipulations regarding its capacity and charging arrangements.

A simple method of using a battery is that in which the general lighting is taken from the mains and the safety lighting from the storage battery, which must be of sufficient capacity to maintain the safety lights throughout the whole time the public is occupying the building. The battery is charged by an engine driving a dynamo or by a motor generator driven from the mains, and it must, to comply with the regulations, be charged before the public is admitted to the building. Thus, if there is an interruption of the main supply the secondary lights are already on and are not dependent on any mechanical or human act.

But there is this weakness, that if the battery is charged by a motor generator driven from the mains and the main supply is interrupted for any considerable time the battery might be discharged before the emergency period had passed and there would be no opportunity of recharging it unless an engine and dynamo is installed for the purpose.

Battery Capacities

The second method depends on a relaxation of the regulations under which the battery must be of sufficient capacity to supply the safety lights continuously throughout the performance; this permits the use of a smaller battery, provided, first, that it is operated in parallel with the motor generator driven from the mains and, secondly, that in the event of a mains supply failure the public must leave the cinema at once.

While this system permits the use of a battery of only about one-third of the capacity of that needed under the first method and also a smaller motor generator, it has the great disadvantage that the cinema must be cleared when a main breakdown occurs. There are also certain technical difficulties concerned with the balancing of the current in the battery and the motor circuits.

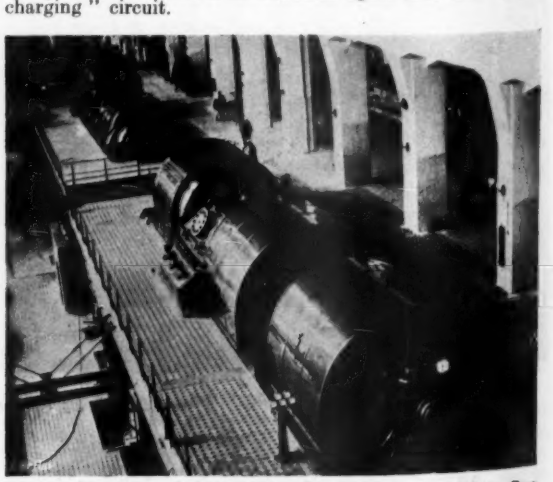
In many instances, electricity is generated on the premises by a self-contained independent plant consisting of an engine—oil, petrol or gas driven—coupled to a dynamo and supplemented by a storage battery. The storage battery in this case provides the second source of supply. Some authorities, notably the L.C.C., require that a self-contained lighting plant consisting of engine, dynamo, and switchboard shall be duplicated, each set being sufficient to supply the maximum ordinary load, or, in lieu of one engine and dynamo, a battery of approximately equal capacity for a minimum period of five hours may be installed.

An independent plant with a storage battery is worth consideration when a big load has to be supplied because, with the low fuel costs and the efficient running of the modern crude-oil engine, it is possible under suitable conditions to generate current at a figure comparing favourably with that charged by supply authorities.

Trickle Charging

The fourth method is likely to be the most favoured installation—the entirely automatic and instantaneous operation of the safety lighting from a storage battery controlled and kept charged by means of simple switchgear. Both the general lighting and the safety lighting are taken from the mains, but the safety lights are of lower voltage and are fed through a resistance. If the main supply fails, an automatic switch throws over the safety lights to the battery with a delay of only a fraction of a second.

This type of installation affords complete safeguard because of its entirely automatic and practically instantaneous operation and its freedom from human error. The battery, although not normally in use, is constantly maintained in a charged condition by means of "trickle charging," by which a very small current passes through the battery and compensates for the slight losses which occur when a battery is unused for any length of time. When the period of emergency is over, the battery is thrown into a circuit where it can be quickly recharged, after which it is switched again into the "trickle charging" circuit.



The turbine room of the Shterovsky power station, Rikov, Don Basin. In the foreground is a 44,000-kW set

Trends in Lighting. By A. E. Iliffe

The importance of physiological and psychological factors

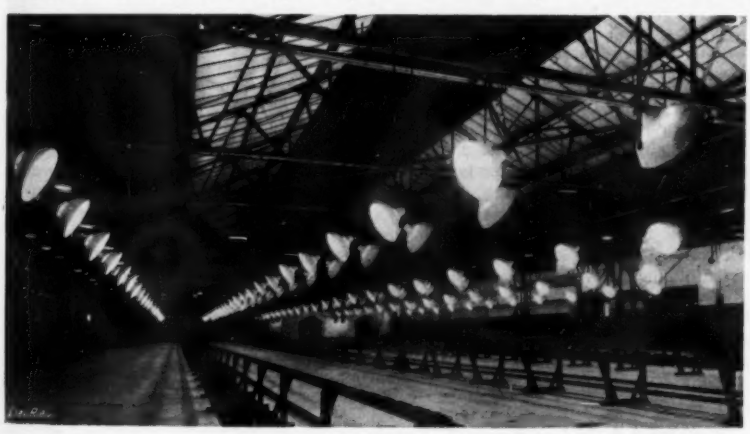
THE development of lamps has necessitated a thorough understanding of the light efficiency of tungsten incandescing at high temperatures, and the scientific lighting equipment manufacturers are able to quote efficiencies of light flux emitted from the source and projected on to the plane to be lighted.

These calculations take one only half way, and, in the opinion of many illuminating engineers, the less important half. The main service value of artificial light does not begin until the light leaves the object illuminated, because this is the beginning of vision—the why and wherefore of light.

The study of "seeing power" causes a student to endeavour to value psychological effect and physiological reactions. These values are far removed from the definite values ascertained in the science of electrical engineering, but, after a tremendous amount of study and research, they have become established, and internationally confirmed by experiment.

It has been contended that the task of the electrical industry finishes at applying the light and that the psychologist and the physiologist can commence where the engineer stops. It is possible that such a practice will be adopted and that a body of "seeing specialists" will come into being. Even so, it will still be necessary for the electrical profession to make itself acquainted with the science of seeing, as with present methods of illumination the electrical consumption for lighting purposes will command the attention its revenue has always deserved.

The demand for energy for lighting purposes has not always been entirely welcome to the distributor, and a poor standard of illumination was accepted by consumers because lighting was regarded as little more than a necessary evil. The work done by lighting specialists during the past thirty years has met with some success, but generally within the industry a state of apathy exists regarding development of the lighting load.



"Glassteel" installation at the works of Briggs Bodies, Ltd., showing the high intensity lighting

Adaptability of the Eye

No definite formulæ for seeing power can be produced when so much depends upon such an ever-changing and non-standard factor as the eye. Light in some form or other causes the sense of sight to function, and then other human output, either mental or physical, begins.

It is assumed that nature intended the eye to work efficiently under natural light quality and intensity, and, taking this as a standard, research has attempted to define the amount of tolerance that the eye possesses so as to establish standards of artificial lighting that are sufficient to prevent loss of physical efficiency through unsatisfactory vision.

Normal vision can operate without appreciable deterioration when the light supplied by artificial means differs fundamentally from daylight, but in extreme cases, such as in the blinding glare of a car headlight or the inability of objects to reflect light owing to an intervening semi-opaque medium, such as fog, seeing power is definitely depreciated. The light quality and quantity reflected from a surface and entering the eye indicates contour and colour, and the ability of vision to operate depends to a large extent upon these factors.

While research has established artificial lighting conditions that promote efficiency of vision, every care has also been taken to investigate the cause of eye fatigue, as so much depends upon continuous ability to see throughout the period of consciousness.

The degree of contrast between an object and its background is a controlling factor which can be measured and contrast values assessed.

Contrast Values

[*Basil, London.*

Mr. A. E. Iliffe is a director and the general sales manager of Benjamin Electric, Ltd.

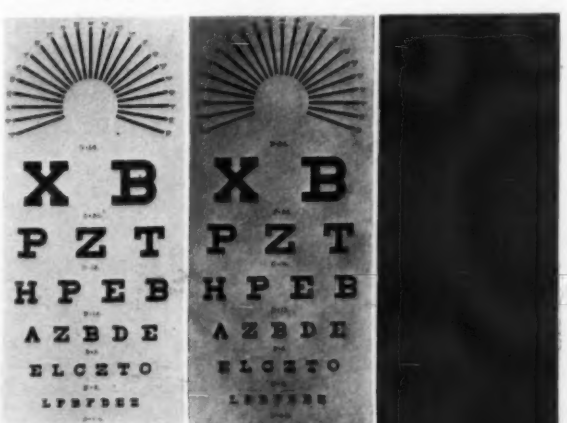
Luckiesh and Moss give 100 per cent. contrast for a perfectly black object on a perfectly white background; 94 per cent. for so-called black print on so-called white paper. Size of object and distance from the eye can be calculated and converted into seeing values, and it will be recognised that contrast and size are the basis of the general ophthalmic test by the oculist with a Snellen chart. This eye test, so usually performed, should, preferably, be carried out under definite light standards, both of spectral quality and intensity.

Assuming an adequate light source, the reflection factor of an object largely controls what is called its brightness, and according to the brightness value so is vision helped or hindered. With contrast poor and brightness value low, vision becomes retarded and a "time of seeing value" enters into the calculation for adequate visibility.

Even with these elementary considerations, it will be seen that light, whether natural or artificial, becomes a service only in so far as it assists the power of seeing. If illumination is expressed in seeing values, then the lumen and foot-candle become only a means to an end. At the present time, investigation has hardly progressed sufficiently to introduce a unit of measurement for seeing power that can claim a full recognition of all the values, both physiological and psychological, that must be assessed.

The illuminating engineer is becoming accustomed to changing formulæ, and is prepared to admit a valuation of influencing factors which are of arbitrary measurement, and it will not be long before light efficiency will be judged on a milli-ambert basis, rather than a foot-candle intensity.

The claims of adequate lighting, when expressed and understood in terms of better seeing power, will achieve a warmer reception from sellers of energy and users of light. The "reason why" of increased physical and mental output, the lessening of



A Snellen chart photographed under different light intensities (20, 10, and 2 f.c.), illustrating how relative brightness and contrast affect degree of seeing power

fatigue, improvement in accuracy of work and reduction of spoilage, all possible with a constructive psychological effect, relies upon the efficiency of light translated into its effect upon visual improvement.

Neither the characteristics of the human eye nor the visual acuity of present-day normal vision indicates the quality of perception that nature intended the human eye to possess. There is a big difference between the perceptive powers of, say, the hawk's eye and the seeing organ of man.

Present Low Standards

It does not take much research work to ascertain that the standard of lighting provided in many factories and workshops is so low that a definite restrictive factor is placed upon human vision. This lack of illumination is present under natural daylight conditions as well as with the inadequate supply of artificial illumination.

Walls, windows and dirt shut out sunlight, and no difficulty would be encountered in finding hundreds, if not thousands, of industrial and commercial buildings where adequate lighting during daylight hours is unattainable. In those premises where daylight penetration has been secured, there have been added capital expenses and increased maintenance charges, so that even daylight upon a productive working plane means cost. In the same manner, artificial illumination cannot be obtained without expense, but when the productivity value of efficient vision is accepted, as it must be in the future, the cost of providing adequate light to enable seeing power will sink into insignificance when translated into efficiency value of physical and mental output.

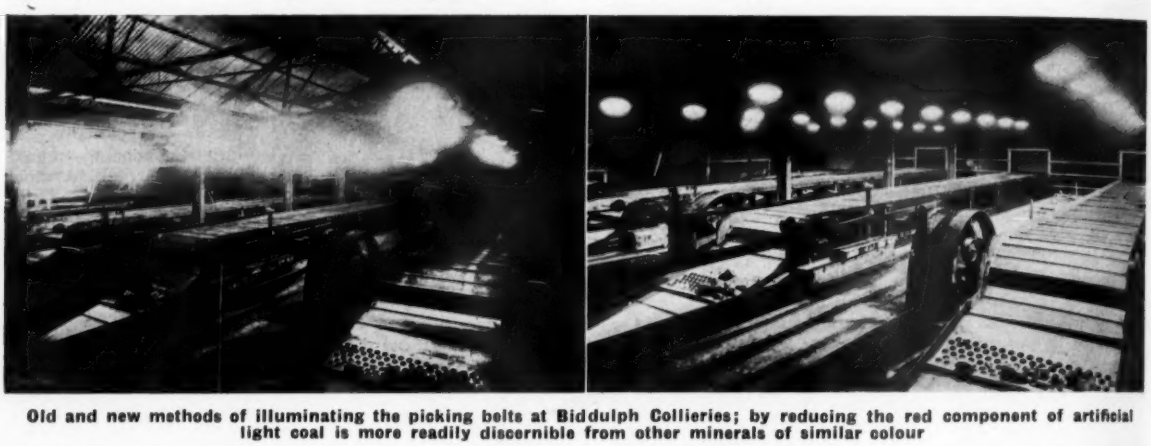
With an accepted standard of adequate lighting, again both in terms of quality and quantity to promote visuality, will come a recognition of the need for more artificial illumination. At present, the electric lighting is switched on only when it is better than perhaps a poor standard of natural lighting. Given a general low standard of artificial illumination, as is to-day existent in Great Britain, the load on the station comes on suddenly and is for the shortest possible period. If, on the other hand, standards were raised, increased hours of burning would result, and the peaks of demand flattened out with an acceptable improvement in load factor.

Cost of Ideal Illumination

In regard to the economics of the question, it has been claimed that the present recommended standards of illumination, which are at least three times as high as general practice, could be supplied for an annual charge of about 2 per cent. of the wages bill. Already there is ample data to prove that at least 15 per cent. increased output, in addition to other benefits, would accrue.

In conclusion, it is necessary to indicate that the average producer who needs the adequate standard of illumination to provide efficient seeing power, is perhaps the most ignorant of all on lighting matters. An examination of the office and home lighting suffered by many responsible executives will confirm this statement. The electrical industry, therefore, will be taking the longest and least remunerative course in waiting for a demand for increased seeing power with artificial lighting.

The need has not arisen for the separate and unattached seeing specialists. There are sufficient lighting experts in the electrical industry to provide useful and practical methods of supplying industry and commerce with reasonable standards of artificial illumination; it is the will to spread the knowledge amongst the tens of thousands of production and commercial executives that is required.



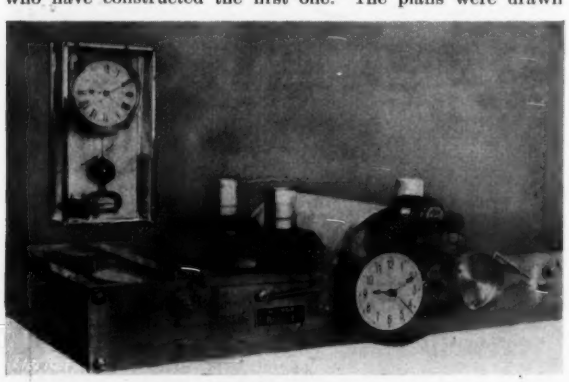
Old and new methods of illuminating the picking belts at Biddulph Collieries; by reducing the red component of artificial light coal is more readily discernible from other minerals of similar colour

A Talking Electric Clock

A Parisian innovation

IT is now possible to tell the time by listening to a clock instead of looking at it, and the Paris Observatoire is soon to have an installation which was recently presented to the Academy of Science by the director of the Observatoire, M. Esclagnon.

This clock is the result of research made by Brillie Frères, who have constructed the first one. The plans were drawn up by M. Nimer, technical director, with the collaboration of M. Le Goff. Every ten seconds the clock will announce in a clear voice the hour, minute, and second. In addition, each full minute will be indicated exactly by a spoken mechanical word.



A clock which tells the time

The equipment consists principally of a drum which an electric motor operates at a uniform speed, regulated by a "Brillie" electric clock. The drum has three registering sets similar to those of a talking film; *viz.*, twenty-four registrations for the hours, sixty for the minutes, and six for the seconds.

Moving parallel to the drum are three reproducers of the Philips type used for talking films: the first for the hours, the second for the minutes, and the third for the seconds. By means of a set of levers, cams, and wheels operated by the drum, each reproducer is always opposite the register which corresponds with the hour, minute, and exact second. A distributor turning at one r.p.m. brings each of the reproducers into action in succession, first that of the hour, then that of the minute, and then that of the seconds, which emits the word "top" at the completion of the full minute.

Each reproducer comprises, in principle, a rectilinear filament lamp, an objective which projects the image of the filament on to the register, a photo-electric cell, and a first amplifying valve. One amplifier, for all reproducers, collects and amplifies the current supplied in rotation by each of the latter. It allows of listening on the telephone or on loudspeakers.

Since the clock has to be in operation continuously, it is fed by storage batteries which are kept constantly charged by the alternating current of the sector by means of a metal rectifier made by the French Westinghouse Co. The breaking of a filament lamp is at once disclosed by a relay mounted in series.

The upkeep is restricted to the replacement of worn-out lamps and the supervision of the motor; a second motor is installed for use in emergency.

Diathermy Protective Devices.

By G. G. Blake, M.I.E.E., F.Inst.P.

The use of the "Contactometer" or contact gauge

EVER since the introduction of diathermic treatment, and more particularly subsequent to its therapeutic application to the eye and internal parts of the body, patients have from time to time received burns due to bad contact at the electrodes.

The author has shown (Royal Society of Arts *Journal*, Vol. LXXX, 1931, pp. 136-138) that when asymmetrical electrodes are employed for administration, at the contact between the electrodes and the patient (when contact is good) the smaller electrode is always negative to the larger. If the contact is disturbed, as it becomes less and less perfect, rectification is reduced, until a point is reached at which sparking takes place between the patient and the smaller electrode. The patient then receives a burn, and the polarity of the electrodes is instantly reversed.

Mr. G. G. Blake is hon. radiographer to the Star and Garter Home, Richmond and other hospitals

A method has been demonstrated of making use of these phenomena in the construction of a "Contactometer" or contact gauge.

Fig. 1 represents a patient undergoing diathermic treatment to an eye. The therapeutic electrodes E E¹ are placed respectively over his eye and at the back of his neck. They are fed with a current from a diathermic generator; C is a condenser in the circuit which allows the high-frequency currents from the generator to pass freely, but prevents the direct current generated by rectification at the electrodes from passing back through the generator. Some forms of diathermic generator are already fitted internally with series condensers, in which cases the condenser C is superfluous. A galvanometer or micro-ammeter G is connected across the two therapeutic electrodes E E¹, and I I¹ are high-frequency chokes wound to an inductance of approximately 400,000 mH and having a self capacity of about 4 mmF. These chokes efficiently protect the galvanometer from the diathermic currents, while they allow the rectified currents to pass through them and deflect the galvanometer. The small condenser C¹ gives additional protection to the galvanometer, but is not essential.

Having placed the electrodes in position, in good contact, and having made the connections shown in fig. 1, a current

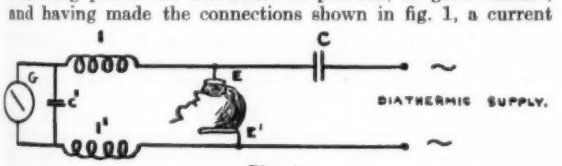


Fig. 1

of about 50 micro-ampères is registered by the galvanometer. The value of this current will depend upon the character and intensity of the diathermic current, and upon the relative sizes of the therapeutic electrodes, as well as upon the degree of good contact which they are making with the patient. If contact becomes less perfect through any cause, the current registered by the galvanometer will be reduced. The readings of the latter therefore constitute a contact gauge, and so long as the diathermic current is switched off *before* the galvanometer has reached zero reading, there will be no danger of sparking taking place between the electrodes and the patient with resultant burns.

In order to be absolutely on the safe side it is better to switch off when the reading has dropped back to, say, 15 micro-ampères.

This arrangement for a "Contactometer" is equally useful as a protection against the possibility of burns in cases in which the smaller of the two therapeutic electrodes is being internally applied to the rectum, urethra, cervix utri, or other internal parts of the patient's body.

Automatic Protection

I have since worked out different methods of automatic protection. The first is the selenium cell method,* and fig. 2 shows the electrical circuits of the apparatus (seen in fig. 3) actually employed.

E E¹ at the top left-hand side of the figure are two asymmetrical electrodes, the smaller of which E is inserted into some internal part of the patient X. These electrodes are fed with current from a diathermic generator through a series condenser not shown in this diagram. The rectified current generated at the contact between the patient and the electrodes causes the deflection of a spot of light from the mirror of a reflecting galvanometer G, while Se is a selenium cell at one end of a cylindrical tube by means of

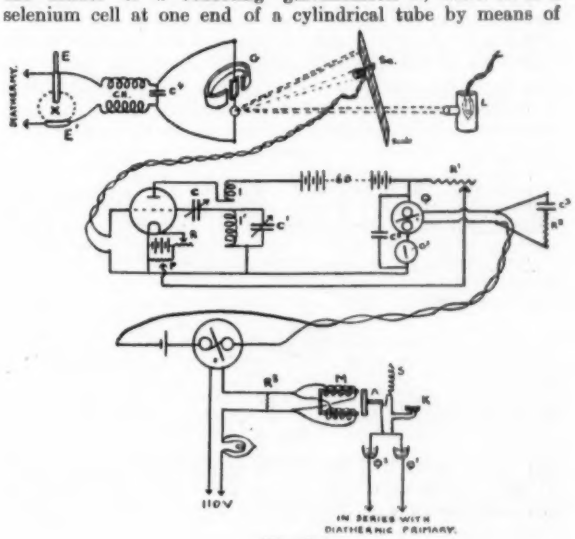


Fig. 2

which it is screened from extraneous light. This cell can be fixed at any desired position along the galvanometer scale to the left of zero.

So long as the contact between the therapeutic electrodes and the patient is good, the beam of light remains on the far side of the se cell. As contact becomes less good the light beam slowly drifts back towards zero and as soon as it falls upon the selenium cell the resistance of the latter is reduced, and by the aid of a thermionic valve and two mechanical relay stages a Harwood cut-out operates and the primary current feeding the diathermic generator is switched off.

Method of Amplification

The diagram practically explains itself, but the method of amplification is as follows: The selenium cell se forms the gridleak of a thermionic valve circuit, which is tuned to oscillate at a fixed frequency, in this case 950 kc. The oscillations are quenched periodically by the correct adjustment of a variable grid condenser C at a low audio-frequency. When the resistance of the selenium cell gridleak is reduced by the action of the light beam from the mirror of the galvanometer, a large increase in the frequency of the audio-frequency note occurs and is accompanied by a corresponding increase in

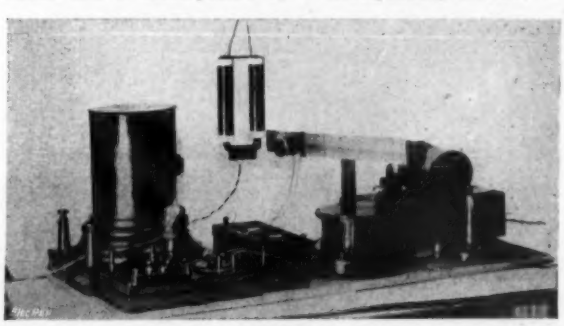


Fig. 3

the plate current of the valve, which operates the relay Q. Fine adjustment of the relay is obtained by the employment and regulation of a zero shunt circuit (see the author's "History of Radio Telegraphy and Telephony," published by Chapman & Hall).

The apparatus shown in fig. 4 is a more simple method of automatic protection, which (given the correct conditions) answers quite well and avoids the employment of a selenium or other light-sensitive cell and the thermionic valve amplifier.

A sensitive relay I is so adjusted that its contacts are kept closed by means of the rectified current from the therapeutic

* It would, of course, be possible to employ any form of light-sensitive cell, electrolytic, photo-electric, or copper oxide.

electrodes E E'. As contact between the patient and the active electrode E gradually becomes weaker (or if it suddenly weakens from any cause) the rectified current falls in value until it is no longer sufficient to maintain the closure of the relay contacts. As soon as they are released relay 2 operates the electromagnet of the Harwood cut-out and the diathermic generator is switched off *before* it has been possible for the patient to receive a burn.

The inset "A" (fig. 4) is a refinement of adjustment which enables a much cheaper and less sensitive relay I to be employed. A small current from a battery B is added to that due to rectification, and fine adjustment of the relay is obtained by variation of the position of the slider P of a potentiometer.

The drift along the scale of the galvanometer due to the weakening of the contact is gradual and, in my opinion, so long as the operator keeps an eye on the galvanometer reading it can always be switched off by hand before the danger point is reached. It is, however, advisable to plainly mark a position on the scale, well in advance of the actual danger point (at which sparking occurs) and to make it a rule always to switch off when the galvanometer drift arrives at that mark.

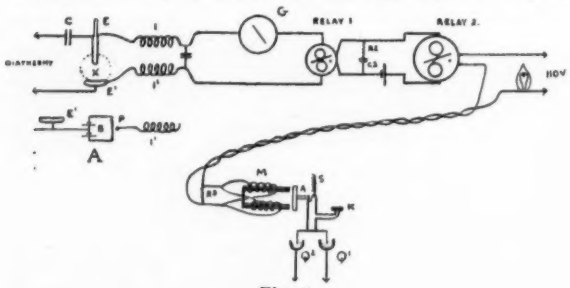


Fig. 4

The Harwood Cut-out

The cut-out to which reference has been made above has been designed by Mr. J. S. Harwood, who contributes the following notes upon the device :—

The cut-out can be operated by push-button, or a minimum-current relay; it is also applicable to any size tumbler switch of the quick make and break type, and can be adapted for a circuit carrying more or less current as required. Choose a switch with a snappy, but smooth, action and cut and drill the operating knob as shown in fig. 5. The small pin P should be fitted in such a position that the switch will only remain in contact while the knob is held down. This position can easily be found by trial and the spot marked for the pin, which should be securely fixed.

The switch Q is mounted as shown and the plunger K is so arranged that in its normal position (*i.e.*, at the upper end of its stroke) the pin in the switch knob is just clear of the upper edge of the space in the side plates. When depressed, the plunger should travel just far enough for the pawl L to engage with the ratchet R of the switch knob. The pawl is lightly constructed and carries a screwed balance rod, so that its normal gravitational position may be adjusted if required.

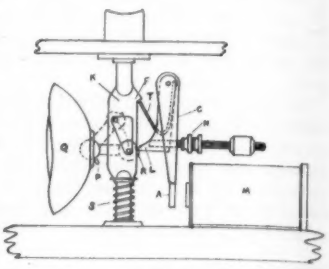


Fig. 5

Suspended freely from the pawl spindle is a light channelled arm C carrying at its lower end an iron armature A. The balance rod of the pawl projects through this arm and carries a nut N by means of which the pawl is disengaged from the ratchet R when the armature is energised by the electromagnet M.

On depressing the plunger the circuit under control is completed in the usual way through the contacts and blades of the tumbler switch Q. At the end of its travel, when the pawl L has engaged with the ratchet R, it is returned to its normal position by the spring S. The armature is normally hanging freely from its spindle some distance from the pole pieces of the magnet. When the magnet is energised by the operation of the controlling relay the pawl is moved from the ratchet and the switch released, thus breaking the circuit.

It is a wise precaution to provide for hand operation in the event of failure, especially in cases in which this would mean danger to a patient. Provision has been made for meeting this emergency by arranging that depression of the plunger K *after* the circuit has been made will result in the mechanical removal of the pawl L and release the switch in the usual way. This is accomplished by the projection F on the plunger engaging with the spring T attached to the pawl. It will be seen that the return movement of the plunger after setting the switch will not displace the pawl, owing to the design of F and T.

A New London Tramcar

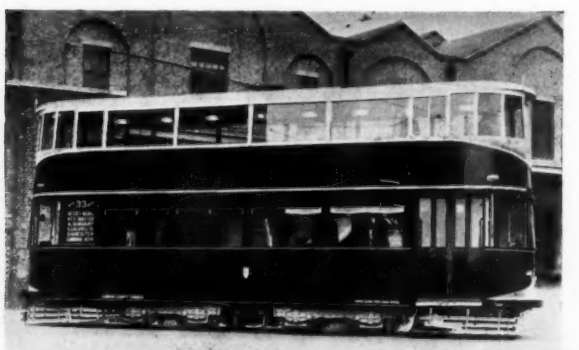
MANY new and attractive features are incorporated in London's most up-to-date tramcar which will shortly make its appearance on the Kingsway subway route. The new vehicle has been built at the London County Council's Charlton Works as an experiment, and, if tests are satisfactory, further cars of similar design will be constructed, the cost of each being approximately £3,000.

A pleasing blue and white finish is used for the exterior and a stream-line effect is obtained by building into the body the portions that project on the standard car. Instead of the usual destination boards on the sides, rectangular illuminated indicators are employed.

Inside blue is also predominant in the colour-scheme of the seats, all of which are of the armchair pattern. Accommodation is provided for twenty-eight persons inside and thirty-eight on the upper deck.

Diffused lighting is obtained by means of 40-W lamps concealed behind frosted-glass panels, and sixteen Siemens tubular heaters, four feet in length, have been installed along the sides of the car between the seats. One of these heaters, which are protected by metal grids, is shown in our illustration. Electrically operated "Faraday" warning bells are also used.

The new tram is driven by four 35-h.p. motors, and has a maximum speed of 30 m.p.h., with an acceleration of 3.5 ft. per sec. per sec.



The L.C.C.'s new experimental tramcar. On the right one of the tubular heaters is illustrated

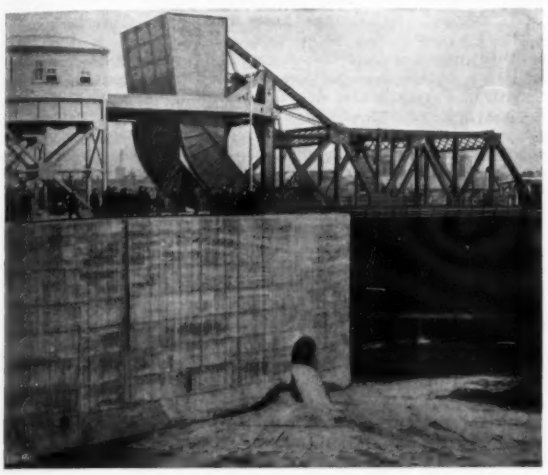
MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

The Past Year's Work of the I.E.E.

AT the sixtieth annual general meeting of the INSTITUTION OF ELECTRICAL ENGINEERS, which was held on May 5th, Capt. J. M. Donaldson, president, proposed the adoption of the Council's annual report for the year 1931-32. It shows the membership to be still increasing, by 214 net during the year to a total of 14,884.

Graduateship examinations were held at ten places at home and in eight countries overseas. The awards of National Certificates and Diplomas in Electrical Engineering were as follows: 597 ordinary and 282 higher certificates, eight ordinary and fourteen higher diplomas. During the year there were



One of the new electrically operated bascule bridges at the Trafalgar Dock, Liverpool

several cases of the use by unauthorised persons of initials or descriptions implying that they were members of the Institution. The discontinuance of such practice was ensured in all cases but one, in which legal action was taken.

The Institution's largest tenant, the British Broadcasting Corporation, is vacating the premises which it has occupied in the Institution building since 1923. A portion of the space so released is being let to the British Electrical Development Association and the Electric Lamp Manufacturers' Association, which are enlarging their offices, and steps are being taken to obtain suitable tenants for the remainder of the available space.

During the past twelve months, 467 meetings have been held in London and at the Local Centres by the members, the Council, and the various Committees.

Activities Abroad

In addition to the local committees which have already been set up in New South Wales, Victoria, and Tasmania, South Australia, Western Australia, New Zealand, and the Transvaal, a local committee has now been set up in Queensland and committees are also in process of formation in the following cities in India:—Bombay, Calcutta, Lahore, and Madras.

Social gatherings, and in some cases meetings for the reading and discussion of papers, have been held with success in New South Wales, Queensland, and Victoria, and Faraday Centenary Celebration meetings have been held jointly with other scientific bodies in New South Wales, Queensland, and New Zealand. The question of increasing further the overseas activities of the Institution is being carefully considered by the Overseas Activities Committee set up by the Council.

The interest and activities of the Wireless Section continue to be well maintained. The average attendance at the meetings was 129, as compared with 107 for last session. The Council approved the issue of a list of members of the Section, and copies were posted with the March number of the *Wireless Proceedings*. The number of members is 590.

In the Meter and Instrument Section the average attendance was eighty, which compares with seventy-nine for the preceding twelve months. The meetings have been uniformly successful. There are now 556 members in the Section.

At the informal meetings the average attendance was sixty-two, as against fifty-five last year.

The eight Students' Sections, *viz.*, at London, Birmingham, Glasgow, Leeds, Liverpool, Manchester, Newcastle-on-Tyne, and Sheffield, carried out a very full programme of meetings, visits to works, and social functions. The actual membership is in the aggregate 3,300, which includes some 1,200 graduates under the age of twenty-eight.

During the year seven annual scholarships were awarded and three grants made (one to a lady research worker at Birmingham University) from the War Thanksgiving Education and Research Fund.

The scheme for the formation of local wireless sections in Canada, in co-operation with the Engineering Institute of Canada, is almost complete and it is hoped that it will be possible shortly to inform members in Canada of the details of the scheme.

The proposed set of Model Conditions "E" for contracts for the supply, laying, and erection of cables at home is still under consideration. The Committee set up by the Council to deal with the matter has been increased to include representatives of additional interested associations.

The Institution was given an opportunity to suggest amendments to the London Building Act, 1930, and the following representations were made:—

(*a*) Electricity generating stations, except in regard to architectural appearance, should be fully exempted from the Act; (*b*) electricity sub-stations should be similarly exempted, except those which abut on other buildings; and (*c*) the right of appeal to the Tribunal provided for in the Act should be allowed to electricity authorities.

Electrical Equipment of Buildings

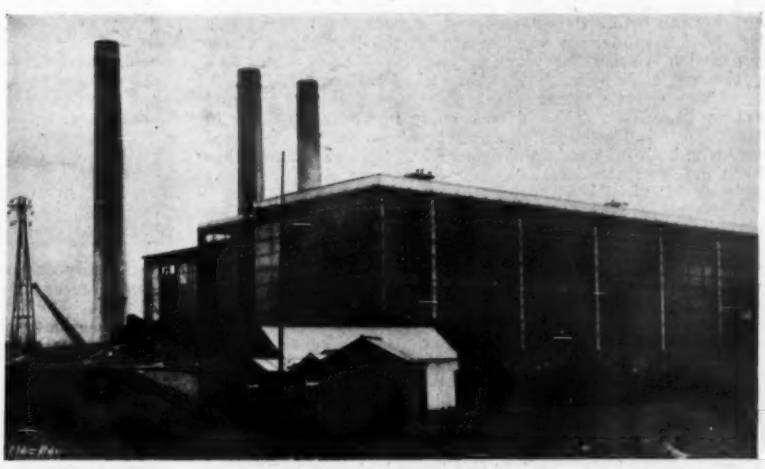
The Wiring Regulations Committee is proceeding with the revision of the present (ninth) edition of the Regulations for the Electrical Equipment of Buildings, and, in order to expedite the work, has appointed a small Executive Committee.

An Advisory Sub-Committee assists in matters relating to the application of the Regulations, and answers inquiries as to interpretation in particular cases. Several new sub-committees have been set up to consider special sections of the Regulations, particularly from the point of view of recent developments, such as luminous tube signs, electric clocks, &c. In order to provide for such switchgear as "splitter units," a new clause (69 M) relating to distribution boards was issued in May, 1931, in the form of a supplement to the ninth edition.

The Electricity Commissioners have published three supplementary regulations for "securing the safety of the public," under the Electricity (Supply) Acts, 1882 to 1928. These relate to "Insulation or Protection," "Underground Shafts, &c.," and "Service Lines into Consumers' Premises." It is understood that the remainder of the safety and supply regulations will be published within the next few months.

A Radiological and Electro-Medical Technical Committee has been set up by the Council to obtain papers on radiological and electro-medical subjects, and to deal with such other matters as may be referred to it by the Council, the aim being to stimulate interest in the electrical engineering aspect of radiology.

The Committee of Management of the benevolent fund of the Institution reports that on December 31st, 1931, the total assets of the fund amounted to £20,461, of which £17,811 was on capital account, and £2,649 in respect of unexpended income. The donations and subscriptions to the fund in 1931 amounted to £3,069. Grants were made to thirty-eight persons, amounting to a total of £1,870.



A view of the new Dunston station of the Newcastle-upon-Tyne Electric Supply Co., Ltd., which is nearing completion. Note extensive use of glass in its construction

After making provision for contingencies, there is a deficit on the revenue account for the year ended December 31st, 1931, of £427. This deficit, which has been carried to the debit of the general fund, and compares with a credit balance of £3,616 in 1930, is entirely accounted for by items of non-recurring expenditure (Faraday Centenary Exhibition, &c). The assets amount to £201,998 against liabilities of £19,597, leaving a surplus of £182,400.

In a discussion which followed the presentation of the report, Mr. W. R. Rawlings advocated larger grants being made by the I.E.E. towards research and development work. Major T. Rich suggested sectionalising the *Proceedings* with a view to reducing the cost of publication. Mr. D. J. Bolton thought something more might be done to counteract the lack of interest shown in *Science Abstracts*.

The report and accounts were adopted.

The Varley Centenary

PRIOR to the annual general meeting of the INSTITUTION OF ELECTRICAL ENGINEERS on May 5th, a short discourse was delivered by Lt.-Col. A. G. Lee in celebration of the one-hundredth anniversary of the birth of Samuel Alfred Varley. [See ELEC. REV., March 18th, 1931, p. 407.]

Both S. A. Varley and his brother were pioneers of telegraphy, but there had been considerable confusion about their work. Indeed, it was recorded in the ELECTRICAL REVIEW in 1889 how, as the result of a paper which Samuel read before the Society of Arts in 1859, his brother Cromwell had been offered the post of electrical engineer to the Atlantic Telegraph Co., the offer being accompanied with an assurance that he might name his own salary.

Cornelius Varley, the father of the two brothers, was a scientist of repute, and delivered the fourth Friday evening discourse at the Royal Institution.

Early Experiments

Cromwell Varley was born in 1828 and died in 1883. His early training under his father gave him a taste for experimental work, and in 1846 he entered the service of the Electric Telegraph Co., being appointed two years later assistant to the superintendent of outdoor work.

The introduction of gutta-percha by Siemens in Berlin gave Cromwell the opportunity of experimenting with the capacity of highly insulated wires to hold a static charge. He concluded that the condenser effect of the wires would offer serious obstacles to the transmission of signals over long distances, but this view was not accepted by the company. Long underground circuits were established between London, Manchester, and Liverpool, but, as he predicted, they would not work. Faraday was called in to help the company out of its difficulty, but Cromwell found a solution by means of his so-called double current system in which a positive current to line was always succeeded by a negative current to counteract the charge on the wire. His first patent in 1854 covered the double current key which earthed the line wire for a short interval between the application of the positive and negative currents.

Rapid development of submarine cables was taking place in various parts of the world and the scheme for laying a cable across the Atlantic to America was prepared. The first attempts were not successful, but on August 5th, 1858, a cable was successfully laid and communication established, a feat for which Sir Charles Bright received his knighthood.

Col. Lee then related how on September 1st, 1858, after 366 messages had been transmitted, communication was interrupted—the immediate cause of which was never discovered—and how the Government in 1859 appointed a Committee to investigate the whole question of submarine telegraphy. Cromwell served on that Committee on behalf of the Atlantic Telegraph Co., which he had then joined. Later Cromwell and Sir William Thomson entered into partnership as consulting engineers, being joined later by Fleeming Jenkin.

In 1861 Cromwell served on a Committee formed by the British Association to determine a rational system of electrical units. The first International Electrical Conference took place in Paris in 1881, and adopted an international agreed system of units now known as the C.G.S. system. The successor to this Conference is to take place in Paris this summer.

The Loop Test

The famous Varley loop test was patented in 1859, and another invention mentioned was the Varley slide resistance. In 1861 a double shed pattern insulator was patented, while to Cromwell Varley is also due the galvanometer with the coil as the moving element. Other devices invented by him were the relay employing the principle of an armature which was magnetised from an external magnet, the first telegraph repeater installed in 1861 in Amsterdam to convert from double current to the Continental single current system, and the "chronopher" for sending out time signals by wire.

Samuel Alfred Varley was born in 1832 and died in 1921. At the age of twenty he went to the Manchester workshops of the Electric Telegraph Co., and two years later, in 1854, he was appointed engineer-in-charge of the Liverpool district of the company. In 1866 he designed an improvement on the needle telegraph and the lightning bridge which was the forerunner of the coherer, used in wireless telegraphy.

The Self-excited Dynamo

His greatest invention at that time, however, was the first self-excited dynamo. Unfortunately, the invention was not published at that time, although he intended to describe it at the British Association meeting in Nottingham in 1866. At that moment Varley was experimenting with his system of train communication, and the British Association paper was never prepared, with the result that other workers secured the credit at the time. A patent was taken out in December, 1866, but was allowed to lapse; a second application in June, 1867, was granted and, although there was considerable controversy as to priority of this invention, Varley apparently succeeded in establishing his case, for he was awarded a Gold Medal at the International Inventions Exhibition, 1885.

Ten years later the idea of regulation came to him and the result was the compound wound machine in 1876. Unfortunately, the patent was allowed to lapse in 1878. The compound wound machine became the subject of a long-drawn-out legal fight in which Alfred Varley contested the claims of the Anglo-American Brush Corporation. Varley's precedence in the invention of the compound wound machine was upheld and the Brush patent declared invalid after an appeal to the House of Lords.

The Rev. Telford Varley and several other members of the family were present at the meeting.

Electricity in London's Docks

A PAPER on "Recent Developments in the Mechanical Equipment of the Port of London Authority" was read on May 6th before the INSTITUTION OF MECHANICAL ENGINEERS by Mr. Asa Binns, whose experience of the Port extends over a period of twenty-five years.

The cost of plant existing at the end of 1931 was £5,894,213, of which electric power plant accounted for £284,487 and cranes £1,432,620. The old dock companies were pioneers in the use of electric lighting, which has been greatly improved recently, both internally and externally. Special attention has been given to entrance locks, dry-docks, and ship and quay lighting for night work.

Twenty-five years ago each group of docks had its own electricity generating plant. To-day these have been superseded by bulk supplies from outside sources. As a precaution against local failure of supply, the Port Authority has in reserve an oil-fired steam-driven floating power station, named the *Volta*, which can be connected to any group of docks at short notice to meet an emergency demand of up to 720 kW d.c.

The largest convertor station is at the Royal Victoria Dock; it was originally provided with three 300-kW rotary convertors, but in 1913 three 1,000-kW convertors were added with the necessary transformers and switchgear.

Increased Electricity Consumption

Twenty-five years ago the total annual consumption was about 1,250,000 kWh. In 1914 this figure had risen to 7,750,000 and in 1930 to 24,000,000 kWh. The present average cost of purchase is under three farthings per kWh, but to this must be added the costs of conversion and distribution.

Nearly 60 per cent. of the hydraulic power used is generated by electric power on the premises. The electrically driven pumps are of various types, including the multi-stage centrifugal type, but in the latest installations variable-speed electrically driven reciprocating hydraulic pumps have been adopted. They are regulated in speed by the position of the accumulator and closely copy the automatic regulation of the steam-driven pump.

A typical plant at the East India Dock station consists of three large and two small pumping units, the larger units being driven by variable-speed d.c. motors of 106 b.h.p. and the smaller units by constant-speed 14-b.h.p. motors through reduction gearing. The motors are controlled by the accumulator; the ram in ascending automatically reduces speed and cuts out each motor in turn with the reverse action in descending.

For refrigeration originally the compressors, &c., were steam driven, but the last steam plant was converted to electric drive ten years ago. At the Royal Albert Dock the refrigerated space is 2,000,000 cu. ft. for 500,000 carcases at 15 deg. F. The machinery consists of ammonia compressors, electrically driven through double helical gearing. There are four large twin-cylinder machines, each driven by a 220-b.h.p. motor at 400 r.p.m., and one single-cylinder machine driven by a 120-b.h.p. motor at 400 r.p.m. The auxiliary plant consists of ventilating and battery fans.

Pumping Operations

Twenty-five years ago, impounding pumps were in operation only at three groups of docks, and all were steam-driven. To-day the pumps are all of the centrifugal type and are operated by electric power. A recent installation consists of three electrically driven pumps of the twin-impeller horizontal centrifugal type designed to pump 10,400,000 cu. ft. of water over a period of four hours, when running together at a speed of 167 r.p.m.

Each main delivery pipe possesses an electrically operated sluice valve worked by an 8-h.p. a.c. motor of the reversing type. The impounding pump motors are of the self-starting synchronous-induction type with direct-coupled exciters, working on a three-phase 440-V 50-cycle supply, starting and synchronising being performed automatically by means of con-

tactor gear with push-button control. Each motor is rated at 350 b.h.p. and is direct coupled to the pumps. The two air-exhauster pumps are of the two-throw valveless suction type. Driven by 15-b.h.p. motors, they are each capable of charging the three main pumps in ten minutes when running at 130 r.p.m.

The five dry docks have been improved, and the pumps, formerly mostly steam-driven, have been replaced by electrically driven centrifugal pumps of greater capacity. The main motors, of the two-phase synchronous type with starting motor and exciter, are direct coupled to the pumps. They run at 375 r.p.m. and develop 820 b.h.p. at 6,600 V. The 150-ton floating crane *London Mammoth* was built at a cost of about £80,000. It is propelled at about five knots by steam-driven twin screws and operated by a steam generator and electrical machinery.

The floating grain plant comprises seven ordinary bucket elevators, of which two are electrically driven and five steam driven, and ten are pneumatic elevators.

Lifting and Transportation

In 1931 the number of cranes was 1,332, of which 354 were electric, mostly of 60-cwt. capacity. There are 160 quay, 144 warehouse, and fifty runabout electric cranes in use at the various docks.

Amongst new types which have emerged is the underslung crane, which is convenient for intensive transit purposes, but it is expensive in first cost and reduces the space for vertical piling. The light runabout crane has proved of great service. There are forty-three opening bridges, of which nine are electric; in addition six have been converted to electrical operation. The whole of the machinery of the silo granary and the four transit silos which was originally driven by gas engines is now driven by electric power.

Lifts, elevators, and conveyers are mostly electric, and amongst mobile appliances there are seventy-one electric trucks of two tons carrying capacity, which have proved a valuable aid for the rapid handling of cargo. The cost of charging plant and battery renewals is a serious item. Taking 1,000 trucking hours per annum per truck and including all capital charges as well as working costs, the total cost per truck working hour, exclusive of driver's wages, averages about 3s. under Port Authority conditions. For distances of less than 100 yards the ordinary hand-truck can usually compete successfully in the matter of cost.

On the floating landing stage at Tilbury railway station electric trucks are used for conveying baggage and passengers are transferred by two electrically driven travelling gantries with elevating covered gangways. The navigation lights, general lighting, and heating are all-electric, while there are a charging station and garage for the electric trucks.

Communication System

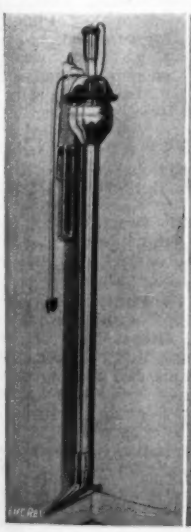
The whole of the docks are served by automatic telephones; there are 740 instruments and some 500 miles of line. The calls on the Port Authority's head office exchange average about 3,000 per day. At Tilbury a system of loud-speaker telephones has been established for intercommunication between points around the dry docks, the caisson, and pumping station.

In twenty-five years there has been a strong tendency towards mechanisation in port terminal services. The application of electrical power has shown remarkable progress; the use of the internal-combustion engine for various services is perhaps somewhat tardy, and the use of hydraulic power appears likely to continue, especially where it is already installed. Reliability is the first essential and must be ensured in view of the fact that the driving of valuable plant is largely entrusted to labour which is unskilled in mechanical engineering. Machinery must therefore be made as foolproof as possible; this applies with especial force to electrical machinery, which is liable to minor accidents under the rough conditions which prevail. Power is cheap, labour and delays are expensive; and it is generally unwise to surrender a reasonable margin of power when specifying new plant.

The increased cost of engineering work of all classes has been a strong deterrent to the process of mechanisation, especially in dock work where the capital charges have to be carried on a machine working week which does not exceed twenty hours on the average.

Electricity at the Paris Fair

THE Palace of Electricity, at this year's Paris Fair, may be divided into three parts: domestic, radio, and industrial. The first of these three is by far the largest and most important, for domestic apparatus takes up at least seven-tenths of the space. It is somewhat disappointing to find only one British firm—the British Vacuum Cleaner and Engineering Co., Ltd. This stand is in charge of Mr. A. H. Skinner, and particular prominence is being given to the "Goblin" Model 30 vacuum cleaner, which is small, compact, and easy to handle.



An electric "broom"

A lamp standard clock

This machine is rated at less than 150 W, a figure which is only surpassed by the German Vorwerk-Kobold, a much smaller machine, weighing 1.1 kg., and using only 60 W. The Ballai-Electric (electric broom), a French product, is unusual; there is no bag or box for the dust; all is contained in the handle. The mouth of the machine is so shaped as to enable it to pick up dust at no matter what angle the "broom" is placed. The motor is placed at the top end of the handle—an unusual position.

There is a marked lack of novelty in electric cookers this year. The firm of Arthur Martin is doing very well with its "Four Gril M.2," which weighs only 40 kg., and has a loading of 1,000 W, controlled by one three-heat switch. "La Miraclette," which is styled a "revolution in cooking," is the French version of the English Stokes cooker, and is attracting much attention. It contains a circular element in an aluminium pan which can be placed over a plate on which the food is cooked.

A French concern calling itself the "Mitis" Company has brought out a lamp bearing that name, equipped with a rheostatic dimming device. This company is showing lamps in all sizes and shapes, and it has also brought out an apparatus on the same system which enables any table lamp to be controlled in the same way.

Attention is also being drawn to a dryer which is being shown by the Société Calor. This is mounted upon a steel table, and is constructed in porcelain and metal. It consists of two rubber rollers driven by a 200-W motor, and a 1,200-W heating element. The Electrolux "Bijou" is the latest contribution in refrigerators.

There is a plethora of small electric clocks. The Société Industrielle d'Horlogerie et d'Appareils Electrique has one rather interesting combined alarm clock and lamp model, which is so constructed that, in the event of the current failing, the clock will continue to function.

In other sections there is very little of interest. The French General Electric Co. shows "Gecovalves," and Wingrove and Rogers are represented by an agent, their Polar condensers being much to the fore.

The Stokes cooker stand

It was rather disappointing not to meet more British firms at the Fair, especially as the show is international in character and the French market is a wide one.

A Newcomer in the Domestic Field

The English Electric Company's latest enterprise

ON May 6th the Birmingham Electric Club visited the English Electric Co.'s Bradford shops, the nucleus of which was the old Phœnix Dynamo Works. The main products of this branch are industrial motors and control gear for small and medium outputs (which lend themselves in some degree to mass-production methods), electrical equipment for railways, tramcars, and trolley buses, and domestic apparatus.

The last-named is probably of the greatest general interest at the moment, indicating as it does the need felt by a company, whose name has hitherto been associated with the manufacture of heavy plant of a more technical character, to meet the situation caused by the development of electric supply facilities in this country.

Electric Fires and Cookers

The first fruits of the new departure are the 1- and 2-kW fires (p. 707), which are now available in five different finishes. The 2-kW model comprises two 1-kW heating units, the upper of which is controlled by a switch built into the casing and arranged for foot operation, the base of the fire being so designed as to prevent its being overturned. A substantial copper-finished guard protects the elements, and means are provided for compensating for their expansion and contraction. A "cold carrying" handle makes the fire really portable. The fire back is stove enamelled, and is so shaped as to avoid chimney effect. Two yards of twin-twisted flex is normally supplied, but provision is made for earthing the metal work. The flex is secured to the terminals by means of Ross-Courtney washers, and the strain on it is relieved by means of an ingenious cord grip within the casing. Non-corrodible washers are used for the connections at all terminals.

The cooker section of the English Electric Co.'s works, Bradford.

That the company is actually building cookers will be evident from the models shown in the photograph reproduced above which illustrates a section of the works set aside for the purpose. The company has quite definite views as to the merits of the design adopted, but we were informed that it does not propose to place the cooker on the market until tests of a number of models under various working conditions have proved it worthy to take its place beside the other products of the company. We had an opportunity of inspecting those in operation in the staff canteen, where they appeared to be giving entire satisfaction.

The intention is not to stop at domestic heating and cooking. Plans are under way to develop cookers for large restaurants, water heaters (on novel and most technically interesting lines), and tubular heating systems, and also to enter the field of industrial heating in its many aspects.

Motors and Control Gear

There are a good many other important pieces of work going through the Bradford shops. Among the more striking are the two-motor bogies for the Liverpool Corporation trams. The weight of these is 840 lb. per axle, compared with over 1,500 lb. for corresponding four-motor equipments, and the only unsprung weight is that of the wheels and axle; the h.p. of each motor is 66 at 755 r.p.m.

The club members also inspected the 42,000-V d.c. dust precipitators, consisting of three double commutator 14,000-V dynamos in series; the current required is very small.

The 27½-h.p. flame-proof motor that has passed the Buxton tests, the tractor motors for the Buenos Ayres Southern Railway and the Danish State Railway, "Closvent" motors, several 5/15 h.p. Schräge motors (with pilot motors controlling drum switches, portable agricultural motors (up to 15 h.p.), and three double-ended welding sets for the new Cunarder were also on view. The standard lines of motors (from ¼ h.p. upwards) and control gear of all types were seen in various stages of manufacture. The drying chambers in which the completed motors are placed for twelve hours are steam heated. The vacuum and pressure (40 lb. per sq. in.) impregnating tanks (two to two and a half hours) are electrically heated.

For gauging the thickness of the mica insulation for commutators a comparometer is used which gives a one-inch deflection for every .001 in. deviation from standard; the copper is also carefully gauged so that for a commutator with a 10 in. circumference the variation is less than .02 in. for 20 segments.

Welding operations were much in evidence, as, although the company has a well-equipped foundry near-by, it is found much more economical to fabricate the frames of generators of about 200 kW and over. It was noticed that the power factor of the works was improved by a 150-h.p. "Kosphi-Leading" compensated slip-ring motor driving an air compressor by means of a belt.

These works present an excellent object lesson in the amount of space to be saved by the substitution of the individual or small-group drive for shafting drives. This is being carried out throughout the works as an economy measure, not the least item in which is the saving on belt maintenance.

Works Organisation

The visitors were entertained to tea by the English Electric Co., which was officially represented by Mr. G. H. Nelson (managing director), Mr. P. N. Rand (chief sales manager), Mr. L. Roberts (factory superintendent, Bradford), Mr. W. E. Clark (manager, Birmingham branch, and social hon. sec., Birmingham Electric Club), Mr. W. A. Gillott, and Mr. C. Hazeltine. Mr. Nelson, proposing the toast of "The Birmingham Electric Club," explained the organisation of the company, and its policy of having each works of such a size that it could be efficiently controlled by one man. Each factory had also an inspection department, which was under his personal supervision. The company was financed entirely by English money. Mr. Entwistle (president, Birmingham Electric Club) responded). We illustrated the Bradford works last week.

Developments in Illumination

OVER one hundred representatives of electricity suppliers, contractors, and manufacturers attended the 25th illumination design course organised by the Lighting Service Bureau last week.

The proceedings opened on May 2nd with a reception by Mr. L. E. Buckell on behalf of E.L.M.A. Visits of inspection were paid to the Jantzen Works, the Institution of Electrical Engineers, the Savoy Theatre, Messrs. Lilley & Skinner's new shoe shop, and the showrooms of the Brompton and Kensington undertaking and the Westminster Electricity Supply Corporation.

Some 21 papers were presented and a general discussion took place, some being in the form of lecture-demonstrations, on varied aspects of the subject, both technical and commercial.

The course concluded with a dinner on May 5th given by the E.L.M.A. to all who attended the lectures. Mr. C. H. Cox, vice-chairman of the E.L.M.A. Council, gave the loyal toast, Mr. L. E. Buckell, of the G.E.C., proposing the health of the guests. Mr. T. P. Wilmshurst, one of the Electricity Commissioners, responded, and paid a tribute to the work of the E.L.M.A. He was followed by Mr. J. Buckley, of the Stalybridge, Hyde, Mossley, and Dukinfield Tramways and Electricity Board, Mr. Hartley and Mr. Liversedge representing supply contractors.

Mr. Cramb, of the British Electrical Development Association, then gave a short speech, referring to the development of the industry from the time when a lamp cost 12s. 6d.

Mention was made by Mr. Jones, of the E.L.M.A., of the recent adoption of a resolution of his by the National Chamber of Commerce at Bournemouth with regard to the lighting of bank premises after office hours.

A musical programme which followed the speeches was arranged by Mr. F. H. Howell.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

An Inquiry from Iceland

With further reference to my letter of January 18th I have to thank you for your help in this matter. I received a great many replies, but unfortunately most of them were from firms dealing in goods other than those for which I inquired. There, were, however, three or four offers of suitable goods, and a trial order has already been placed.

I am afraid that it is not possible for me to reply to all who wrote. Possibly you would be so good as to put in a small note to this effect, and to say that I am communicating with those that I can put in the way of business.

Please accept my thanks for your help in endeavouring to find further markets for British goods. ARTHUR GOOK.

Akureyri, Iceland, *April 26th*, 1932. *British Vice-Consul.*

Condensers or Motors?

I have read the remarks in the leading columns of your issue of April 22nd under the above heading, also the letter published signed by "J.P.S.P." in the April 29th issue.

In reading your leading article one would suppose that many consumers who install static condensers for power factor correction are being badly advised, and that it would have been far better to install some form of compensated motor. "J.P.S.P." states that it pays handsomely with a kVA tariff to correct the power factor to unity, swinging load or otherwise. Personally, I have always considered that any attempt to correct to unity power factor is a dangerous and an expensive procedure, particularly with a swinging load, as it is so difficult in aiming at unity power factor to ensure that at times of maximum load the power factor will not be leading when it would have an adverse effect on the kVA demand.

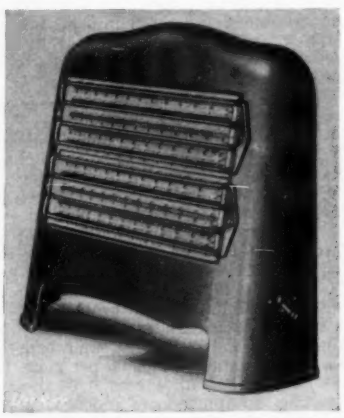
I disagree with "J.P.S.P." that the use of the static condenser is suitable only for small or exceptional schemes. It is evident that your correspondent knows little of what has been done with the static condenser, otherwise he could not have expressed such a view. The broad fact remains there is nothing so reliable and robust on the market to-day as a collection of induction motors of the squirrel-cage or slip-ring types combined with a well-designed static-condenser equipment, and this has been readily recognised by consumers paying on power factor tariffs throughout the country and abroad.

I entirely agree that the large power consumer should be protected from non-technical advisers, but would go further and say that it is very desirable to ensure that he is being advised by someone who understands the problem, and not by one who would apparently rule out the static condenser for other than small or exceptional loads, and who would invariably endeavour to correct to unity power factor, which in my opinion is not only uncommercial, but unwise.

London, W.C.1, *May 7th*, 1932. E. W. DOREY.

Anomalies in Earthing

The question of earthing has received a great deal of attention in your columns, but I have found that many of the younger engineers, and even some of the older, forget the primary facts. However good an earth connection may be, it is merely a resistance which varies considerably in value with local conditions.



One of the "English Electric" fires described on the opposite page

The question of earthing has come more to the fore of late, owing to the popularisation of radio apparatus. Many consumers with no electrical knowledge have experienced the peculiar effects of earths on their apparatus, whether "all-mains" or battery sets, and a few facts may prevent accidents.

Although the middle wire of a three-wire system is earthed at the power station or sub-station, it is not at earth potential when carrying current even a short distance away, owing to the voltage drop. In the earlier days of wireless I was experimenting with an all-mains set, before these were on the market, and connected up the apparatus in such a way as to earth the middle wire through the set to a water-pipe. A few minutes later it started to smoke.

If a bad earth fault occurs on one of the live conductors of a distribution system, the potential of the middle wire may be well above (or below) that of the earth, and, where manholes with iron frames are connected to the lead sheaths of the cables, their covers will be made alive. Even though they are buried, there may be sufficient potential between them and the neighbouring ground at a distance covered by a man's stride, or the paws of a dog, to cause a severe shock.

Contractors are often permitted to earth their tubing by the lead covering of the service cables. In the event of a bad earth fault the tubing may become alive, even if only temporarily, and if in contact with gas-pipes may cause trouble. I remember a fire due to this, but neither the consumer nor the insurance company ascertained the real cause.

In large d.c. networks temporary earths on either of the outers are very frequent. The regulations provide for the earthing of the middle wire by an automatic switch which opens and substitutes a resistance when the earth current exceeds a certain amount. Is it realised that in some large undertakings these switches are never closed, and that if they were they would not remain in many minutes?

Apart from this, the resistance of the earth itself may vary with the dampness of the soil, the surface contact of the earth plate, the chemical nature of the soil, and many other factors. Moreover, while the resistance to earth on test may be low, it may rise rapidly after carrying a heavy current. Where the outer of a high-voltage single-phase system is earthed at the power station, its potential outside may rise to a very high value under a short circuit.

I remember the outer of a 2,000-V feeder flashing over to the iron case of a switchbox less than a quarter of a mile from the power station, where it was solidly connected to earth plates under the cooling ponds. After this experience we decided to cover with mica the sides of the box in proximity to the outers, the links of which were left bare when installed. Earthing problems give more food for thought than do most!

London, N.7. *May 9th*, 1932. W. E. BRADSHAW.

Who Should Receive Trade Discounts?

I have read with great interest the correspondence which has appeared in your pages from time to time upon the subjects of jerry wiring, unauthorised discounts, and what is contemptuously referred to as the "spare time merchant."

Now, what exactly constitutes unauthorised discount? Is the local gas fitter, plumber, decorator, garage owner, ironmonger, builder, music retailer, etc., to be given preference over a skilled man, doing conscientious work at a fair price, merely because the last-named has no shop window?

Surely, if a man's employers have no objection, he is entitled to employ his spare time in a manner profitable to himself, provided that the manufacturers' conditions of sale, etc., are observed, and that the work is done for a price comparable to that of a full time contractor, who naturally has higher overhead charges? I would hasten to add that I have no time for the "botcher" or the cut-throat price merchant; in my opinion it should be illegal for unqualified persons to carry out electrical work.

I have had fourteen years' practical experience, during which time seven years were spent in evening class technical training; as a result I have a number of certificates, and have passed the graduateship examination of the Institution of Electrical Engineers. All work that I do is strictly in accordance with the I.E.E. regulations. From the tone of some of the letters I have read, it seems that the manufacturers and wholesalers would regard me as unqualified to receive trade discounts for material which I wish to resell in my spare time; it seems that they would rather favour any Tom, Dick, or Harry, irrespective of knowledge, qualifications or ability—provided "Electrical Engineer" is inscribed over their shop-windows.

Who is more able to render service after sales, should it be necessary? How often do manufacturers have to send their own men to service goods sold by "Blank & Co., gas, hot-water, sanitary and electrical engineers"?

May 3rd, 1932. GRAD, I.E.E.

Callender Athletics

On May 7th the London section of the Callender Athletic and Social Club held its annual ten-mile walk at Brighton for the "Charles Pipkin" cup, the winner being Mr. J. H. Peters, of the Contracts Department. In the afternoon there was a gathering at the Aquarium for tea and presentation of the cup, prizes, etc., by Miss Foulds, the daughter of Mr. Howard Foulds, secretary of Callender's, who took the chair. Mr. Foulds was supported by Mr. P. V. Hunter, chief engineer and manager, Mr. W. G. Hendrey, overseas manager, Mr. F. B. Collard, contracts manager, accompanied by Mrs. and Miss Collard, and Mr. G. Petersen, chairman of the Club, together with his wife and daughters. Messages were sent from the gathering to Sir T. O. Callender and Mr. T. Petersen, and also to Mr. C. Pipkin, joint manager and donor of the cup, who were unable to be present.

The guests included Mr. F. Swarbrick (the Hove electrical engineer) and Mrs. Swarbrick, Mr. W. H. Liggins (deputy electrical engineer, Hove) and his wife and daughter, Mr. A. Butcher (mains superintendent at Hove), Mr. G. Porter (chief electrical engineer, Worthing) and Mr. F. Ffrench (electrical engineer, Horsham) and his wife.

Radio Developments

Standard Telephones and Cables, Ltd., re-enter the domestic market

INTERESTING developments are foreshadowed by the announcement that Standard Telephones and Cables, Ltd., are about to re-enter the domestic radio market with a new range of receivers. For the past six years this company has confined its radio activities mainly to the commercial field, specialising in international radio links and broadcasting stations. It will be remembered that the Empire broadcaster for the B.B.C. is at present being made at the company's factory, as well as others for Kalundborg and Lisbon.

One of the results of research has been the development of a novel new valve, known as the "Micromesh," which embodies radical changes in design and construction. The outstanding feature of this valve is the extremely close spacing of the electrodes, and an idea of this closeness may be gathered from the fact that the cylindrical anode, inside which the grid and the cathode assembly are mounted, is less than one-eighth of an inch in diameter. The difficulty hitherto has been that of securing mechanical rigidity, and the fact that if the grid is too close to the cathode the heat transmitted to the grid raises it to such a high temperature that material deposited on it from the adjacent cathode causes it to give off electrons, and thus introduce distortion.

Mechanical Precision

With a large fin for radiating purposes attached to the grid extremely close spacing could be utilised, but the problem was to maintain the requisite degree of mechanical precision on a production basis. The solution was finally found by constructing the valve as a unit, with all the elements secured into upper and lower mica insulators previously fashioned to the necessary accuracy by perforating them on a punch press. The elements are secured to these mica bridges at the top and bottom, and the assembly thus formed is a separate unit, entirely unaffected by the stem.

The fact that the grid radiating fin is not surrounded by any other element makes it possible for its heat energy to be radiated directly out of the bulb, and the grid is permitted to be brought into close proximity to the cathode without involving danger from grid emission.

The cooling of the grid is so effective that it gives no emission, even when between a cathode and anode both at red heat. The cathode, which runs normally at dull orange heat, is free to slide at one end and so cannot warp through thermal expansion. The heater is effectively insulated from the cathode and requires 1 A at 4 V. A robust nickel cathode is employed, which gives perfect electrical heating combined with adequate rigidity.

There are two grid supports on one side of the cathodes, two anode supports on the other side, and the cathode support is in the middle. These are the only support wires. The plate is in two halves, each half consisting of a plate portion proper

The new "Micromesh" triode valve. Right: A magnified view of the triode assembly with portions of anode cut away

and a supporting fin. The two fins are welded together, and the plate portions form an anode, in the cylindrical portion of which a slit is left to permit exit of the grid fin.

Three New Types of Valves

At present three types of "Micromesh" valves have been designed by the company. The detector (type H.L.A.1) filament requires 1 A at 4 V, and the valve has an amplification factor of 80, an impedance of 10,000 ohms, and a mutual conductance of 8 milliamperes per volt at 100 anode volts and zero grid volts. The power output (type P.A.1) has a similar filament, an amplification factor of 12.6, an impedance of 1,050, and a mutual conductance tested as above of 12 milliamperes per volt. The full wave rectifier (type R.1) is designed to deliver 60 milliamperes at nearly 300 volts d.c. with an input of 250-0-250 r.m.s. volts.

It is possible to apply the "Micromesh" principles to the design of screen-grid valves, and this type will be in production in a few months. Plant for the mass production of the valves is being installed at the company's New Southgate factory.

While the first deliveries will be required for standard and Kolster Brandes receivers, it is anticipated that supplies will

The new Ediswan lighting equipment in Piccadilly Circus, London

be available for the public by the autumn. The design of the new valve is British, all the development work having been carried out at the company's Hendon works.

The New Receiving Sets

Four types of receiving sets are being planned for production, and they will incorporate the new valves.

The first is a 2-valve a.c.-operated self-contained set, with a moving-coil speaker, fitted in an attractive walnut case. A very distinctive feature of this set is that it will cover the ultra-short as well as the medium and long wavelengths, and it is believed that this will be the first 2-valve set to embody this feature.

Short-wave working is effected by two special plug-in coils, covering 16-35 and 35-70 metres respectively. Universal voltage input, a gramophone pick-up jack, illuminated tuning scale, and vertical chassis construction are other features of this set, which is expected to be in regular production by the end of the summer.

The next set, which will probably be ready in time for the Radio Exhibition, will be a somewhat similar 2-valve battery model, embodying a moving-coil speaker.

The other models planned are an a.c. super heterodyne and a 3-valve band-pass set, but these will probably not be available before the end of the year.

Blast-furnace Engineering

IN one of the several papers which were read at the annual meeting of the Iron & Steel Institute last week, Mr. W. R. Brown made particular reference to the Dagenham furnace of the Ford Motor Co., Ltd., and the Pretoria furnace of the South African Iron & Steel Industrial Corporation, Ltd., both of which are to make 500 tons of iron per day.

For the electric power actually used in plant operation, he said that it was wise to limit the voltage to 230 to 250 d.c.

At Dagenham two self-propelled 50-ton electric transfer cars operate on the high line, drawing materials from the weigh hoppers of the unloaders, and bringing it ashore. There is also a reclaiming car of 50 per cent. larger capacity primarily intended for handling coal. All these cars are fitted with air-operated dumping doors and brakes, induction time-limit control with mill-type motors, and dead-man control on the drive. Both cast houses are served by 10-ton overhead cranes, and an electric rotary clay gun plugs the tap-hole at Pretoria, a double-barrel piston gun being used at Dagenham.

The sequence of operation of all moving parts of the charging gear is governed by the charging control panel. A skip tub having been filled, the scale car operator needs only to press a button, the skip ascends and dumps into the distributor, the latter rotates, the small bell opens, and, at the correct interval, the stockline recorder test rod withdraws and the large bell dumps.

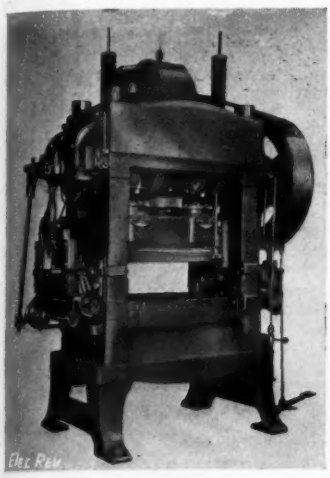
At Pretoria the gas passes from the dust-catcher to a Lodge Cottrell electrostatic dust precipitation plant of the two-stage type. At Dagenham the gas is wet cleaned.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Power Presses

In the endeavour to economise time, labour and money, automatic press equipment has developed considerably. The change from C-frame types to special straight-sided presses has lengthened tool life. Die steels are much better; improved auto-feeding has added safety and speeded up production; the speed of operation has risen materially; and the setting-up time has been reduced. Built-in and individual motor drives increase efficiency by eliminating line-shafting and belting, and also facilitate the straight line lay-out of machine shops, thus avoiding the necessity for inter-stage storage areas.



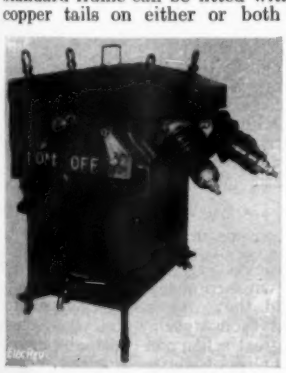
A Bliss power press

There has been a decided improvement of this class of equipment, and high-speed presses make it possible to keep ahead of production schedules. Machines supplied by MESSRS. E. W. BLISS CO., Pocock Street, Blackfriars Road, S.E.1, are available in a variety of types and sizes, adaptable to most requirements, from small models that make from 300 to 600 strokes per minute up to 350-ton presses that operate at 100 strokes per minute. One of these is illustrated.

Noise and vibration are minimised by the low centre of gravity and balance. The proportions are massive, and the high-speed rolling key clutch with its auxiliary fittings, and the compactness of all moving parts, lead to quick action. A roller grip drive speeds up the feeding range and maintains accuracy, the machines will accommodate with equal facility single or multiple dies of the compound, follow, or combination types. Accessibility is a feature which assists in reducing the full automatic set-up time to a general average of from 15 to 30 minutes.

Pole-mounting Oil Switch

A new oil circuit breaker, suitable for mounting on "A" or "H" poles, has been introduced by MESSRS. JOHNSON AND PHILLIPS, LTD., Charlton, S.E.7. It is so designed that the standard frame can be fitted with porcelain insulators for bare copper tails on either or both the incoming and outgoing sides; alternatively, a cable box for a three-core cable can be fitted at either or both ends of the switch. The operating handle, fitted at the base of the pole, can be locked "on" or "off," and the gas-tube drive is so placed that it lies snugly along the side of the pole.



A J. & P. pole switch

The switch contacts are of h.d., h.c. copper of the finger type used in the heavier sub-station breakers made by the company. The three overload direct-connected pattern trip coils are provided with an easy form of adjustment on the outside of the switch, shown in the illustration to the right of the "on and off" indicator; the latter can be seen from ground level. The switch is prevented from opening on transient current by an adjustable oil dash-pot time lag. The tank can be lowered without being removed from the pole. Eye bolts are fitted to the top of the switch to facilitate raising it to its position on the pole.

The "Electrolux Minor" Refrigerator

The new "Electrolux Minor," which we described on April 22nd, although embodying similar features to the larger models, differs in respect of the cooling as the small model is air cooled.

A Small Electric Soldering Iron

There is an increasing demand for a small soldering iron for light instruments and wireless work. The "Midget," which we have received from BROWNING'S ELECTRIC CO., Imperial Works, St. Martin's Avenue, East Ham, E.6, fulfils this purpose, as it weighs only 7 oz., and is rated at 45 W. Various shapes of copper bits are available, and are interchangeable without disturbing the element through which the bit passes. The iron is of a convenient shape for holding, and the metal portion (except the bit) is heavily plated. It is supplied with two yards of twin or three-core flex, and is made for 100/110 V, 200/220 V, or 230/250 V.

An Improved Winch

THE LONDON ELECTRIC FIRM, Brighton Road, South Croydon, announce an improvement in their winches which now give one turn of the handle to one of the barrel. These winches are obtainable capable of dealing with all weights up to 10 cwt., and are suitable for raising and lowering street lamps.

An "Overlamp" Reflector

A reflector that fits over the lamp has recently been marketed by VERITYS, LTD., Plume Works, Aston, Birmingham. The reflector can be removed by merely lifting and then turning it slightly, when it will become disengaged; it can therefore be taken down to be cleaned with the lamp in position. The reflector is made in sizes of 12, 14, 16, or 18 in. diameter, and for lamps of up to 500 W.

"Verity" overlamp reflector

Shaker Conveyor Joints

Reduction of the cost of shaker conveying is claimed to result from the use of the "M. & C. Ritchie" joint whenever the conveyor has to be frequently disconnected and joined together again. This joint is used chiefly underground in coal mines and is a product of Messrs. MAVOR AND COULSON, LTD., 47, Broad Street, Mile End, Glasgow. The joint is made by two stirrups, each of which carries a set-screw. When coupling the troughs together, one of the set-screws is screwed tight (the other left correctly adjusted) and the ends of the butt straps are made to yield a little. This initial tightening prevents backlash or chatter developing at the joints, even with troughs that have been in use for a long time.

An Electric Bicycle

The electric bicycle to which we referred in our issue of April 29th was invented by N. V. PHILIPS' GLOEILAMPENFABRIEKEN, Eindhoven, Holland, and is being manufactured by five selected Dutch companies.

The chief aim has been to combine efficiency with light weight. The machine has a reinforced frame with 28-in. wheels, and is driven by an easily interchangeable 12-V accumulator which can be charged during the night by using a 5-A rectifier which forms part of the equipment. The time taken to charge a completely exhausted accumulator is about twelve hours, and the electricity consumed 2 kWh.

The electric motor, which is fixed in the frame under the saddle, is claimed to have a very high efficiency (72 per cent.). The driving chain to the back wheel is completely protected, while the control for switching on and off is mounted on the handlebar with the ammeter. The motor may be cut out at any time by the handlebar switch and the pedals used.

Fifty miles on one charge is claimed by the designers, but by economising in the use of the motor considerably more than fifty miles may be covered on one charge. The maximum speed is about 13 m.p.h., and a mileage recorder indicates the distance covered. The surplus weight of the electrical equipment is about 30 kg.

The Philips electric bicycle

Staff Changes at Bristol

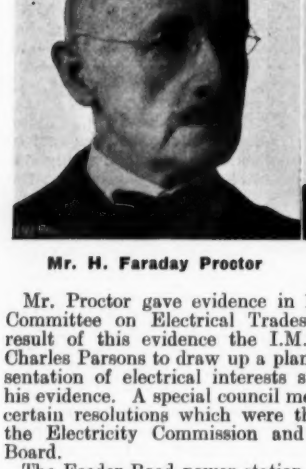
AT a meeting of the Bristol Corporation on May 10th, changes in the staff of the electricity undertaking were approved, to be effective as from November 1st next, consequent upon the retirement of Mr. H. Faraday Proctor, the chief engineer and general manager.

Mr. Faraday Proctor received his education at Rutherford College, and after passing through the Durham University College of Science (now the Armstrong College) served an indentured course with Messrs. H. Watson & Son, mechanical engineers, Newcastle-upon-Tyne. In 1889 he was appointed chief assistant engineer on the commencement of the Newcastle-upon-Tyne undertaking. He relinquished this position and went to Bristol in October, 1892, and in August, 1893, a supply of electricity was given to the Bristol Arts and Crafts Exhibition from the Temple Back Works. In 1895 a few municipal electrical engineers met at dinner in London, and from this meeting the Municipal Electrical Association was conceived, and Mr. Proctor served on the first committee; he was one of the signatories of the Articles of Association upon its incorporation in 1901. He became president of the Association in 1898, and in 1905 was elected hon. secretary of the Association, an office which he retained until 1919.

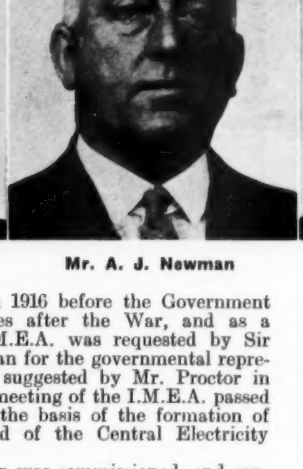
Work on the scheme was commenced in 1927, and the Portishead station was put into commission in 1929 with two 20,000 kW generators; these have been supplemented by a 50,000 kW set, which is the largest set in commission in Great Britain.

Mr. A. J. Newman, who will succeed Mr. Proctor in November next, received his training as a mechanical engineer in Ireland. He entered the electricity supply industry by passing through an electrical engineering course at the Merchant Venturers' Technical College, Bristol. He joined the Bristol Corporation Electricity Department in 1903 as an indentured pupil, and was soon afterwards appointed fuel combustion expert, and subsequently superintending charge engineer at the Temple Back Works. Joining the Mains Department in 1907 he was appointed distribution superintendent in 1910, and in 1915 he became deputy to the chief engineer and general manager.

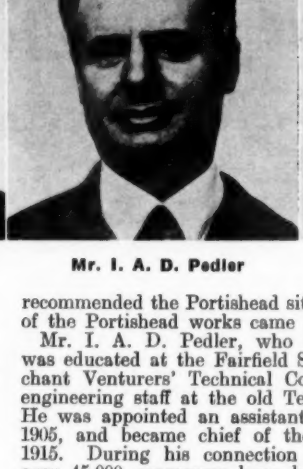
Mr. Newman is a member of the Institution of Electrical Engineers, the Institution of Mechanical Engineers, the Institution of Structural Engineers, and of the Institute of Fuel. He was appointed a member of the Engineering Investigating Committee set up by the Electricity Commissioners which



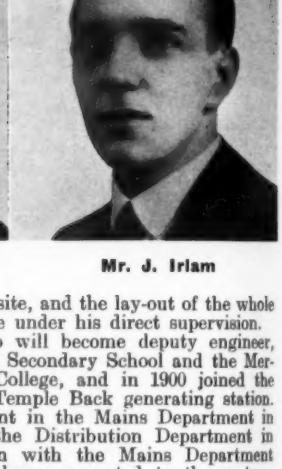
Mr. H. Faraday Proctor



Mr. A. J. Newman



Mr. I. A. D. Pedler



Mr. J. Irlam

Mr. Proctor gave evidence in 1916 before the Government Committee on Electrical Trades after the War, and as a result of this evidence the I.M.E.A. was requested by Sir Charles Parsons to draw up a plan for the governmental representation of electrical interests suggested by Mr. Proctor in his evidence. A special council meeting of the I.M.E.A. passed certain resolutions which were the basis of the formation of the Electricity Commission and of the Central Electricity Board.

The Feeder Road power station was commissioned, and continued expansion of business followed.

In 1910 Mr. Proctor was elected to the Council of the Institution of Electrical Engineers, on which he remained for eight years, and in 1912 the local Western Centre was formed, Mr. Proctor being the chairman in 1913. He was a member of the Committee which drafted the constitution of the National Whitley Council for the Electricity Supply Industry, and he became first chairman of No. 6 Area.

The Feeder Road station having become inadequate, Mr. Proctor was requested by the Electricity Commission to form an Engineering Investigating Committee, whose chief problem was to select a site for a generating station which would be a base load station for the whole of the Lower Severn Area. This Committee finally recommended a site at Portishead.

recommended the Portishead site, and the lay-out of the whole of the Portishead works came under his direct supervision.

Mr. I. A. D. Pedler, who will become deputy engineer, was educated at the Fairfield Secondary School and the Merchant Venturers' Technical College, and in 1900 joined the engineering staff at the old Temple Back generating station. He was appointed an assistant in the Mains Department in 1905, and became chief of the Distribution Department in 1915. During his connection with the Mains Department over 45,000 consumers have been connected to the system, 650 miles of cable have been laid, and the complete change-over from the single-phase to the standard three-phase system has been accomplished. Mr. Pedler is a member of the I.E.E.

Mr. James Irlam, who has been appointed constructional engineer, was educated at the Stretford Technical Schools, and the Manchester School of Technology. He started his engineering career with the old British Westinghouse Company (now Metropolitan-Vickers Electrical Co., Ltd.), at its Trafford Park Works, and was associated with the General Engineering Department from 1912 to 1926, interrupted only by war service. In 1926 he was appointed chief draughtsman to the Bristol Electricity Department in connection with the preliminaries to the Portishead generating station.

Mr. Pybus on the Grid

ON May 6th, during the discussion of the vote for the Ministry of Transport, Mr. Parkinson, the former Parliamentary Secretary to the Ministry, inquired what progress had been made with regard to the national grid under the Central Electricity Board. It was seldom, he said, that they heard mention of the latter scheme in the House of Commons. It should be given close attention. The work of the Board had been conducted well so far. It must not be forgotten that the Board was a public corporation, and the way in which it had done its work had proved that public corporations were more, rather than less, efficient than ordinary private companies. He asked whether the Minister was satisfied that the consolidation of generation now being carried out by the Board was sufficient, whether the national consolidation of the distributive side should not now be considered, and whether the Minister would be prepared to encourage the vigorous development of the sale of electricity under the distribution Order for the development of electricity in the homes of the people.

Mr. R. J. Davies expressed pleasure at the fact that electricity was going into the countryside by means of the grid.

Mr. Pybus, the Minister of Transport, in reply, said that the grid had proceeded with a speed and an efficiency on the part of both the contractors and the Central Electricity Board which was creditable to both. The grid was practically complete, but it was only, if he might use the phrase, an express train at the moment. People saw what was wrongly called a " pylon " in the air, and the wires coming from one direction and going on in another, and they wondered when, so to speak, the train would stop at their station, and when they would reap the benefits of this great scheme of central electrical development in the form of supplies of cheap electricity. That was a very important point. They had finished the rationalisation of the high-pressure supply. The rationalisation of the low-pressure supply, which would make available in urban and rural areas electricity for the farmers and people who lived in the countryside, depended on a much more rapid progress with regard to the co-ordination of distributing authorities than was at the present moment in view.

If he were to be asked what would most help forward the cause they all had at heart, it was that, having made this great venture in rationalising the generation of electricity, and the grid system, they should see at any rate that the benefits of it were made available as quickly as possible up and down the countryside. There were no fewer than 600 separate and properly authorised authorities who had the right of distributing electricity, but as long as it was impossible properly to co-ordinate this low-pressure distribution, so long would they be wasting capital in overlapping, in inefficient and sometimes competitive extensions. Those facts imposed on them the necessity, having accepted the grid, to go one step farther and deal with the distribution of electricity in an equally logical way.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Industry and the Empire

A report has been drawn up by a committee of the Federation of British Industries, under the chairmanship of Sir Hugo Hirst, in connection with the forthcoming Empire Economic Conference at Ottawa. The Federation stresses the paramount need for a policy of Empire economic co-operation broadly conceived and actively prosecuted, and having stated the reasons for this necessity, the authors of the report examine in detail the following questions:—(1) Empire tariffs. (2) Complementary industrial production within the Empire. (3) An imperial investment and monetary policy. (4) Close and constant economic consultation within the Empire. (5) The potentialities of the Crown Colonies. A number of appendices throw a considerable light on some of the more detailed and complicated problems which are bound to arise at the Conference.

The I.C.I. Exhibition

In our last issue we mentioned an exhibition of products which is now being held by Imperial Chemical Industries, Ltd., at Thames House, Millbank, S.W.1. The accompanying illustrations show two of the rooms used for demonstrating electric lighting fittings produced by Lighting Trades, Ltd. In one are displayed fittings of the old-fashioned types, while in the other, as a contrast, are examples of the latest models of modern glassware, tubular fittings, &c. The exhibition closes next Monday (May 16th).

Electrical Contractors Criticised

At the last meeting of the Kirbymoorside Rural District Council a discussion took place concerning the alleged practice of electrical contractors in soliciting contracts for house wiring in villages and in selling electrical appliances to residents before arrangements for the installation of electricity had been definitely made. There have been many complaints from a wide area, with the result that several of the Yorkshire authorities have been in communication with the Cleveland and Durham County Electric Power Co. on the subject. In a letter read at the meeting of the Council the company explained that they had no knowledge of what was going on in Ryedale and elsewhere, and as soon as they learned of the practice they took steps to stop it. They added that all electrical contractors are advised that before canvassing any given area they should ascertain from the company whether a scheme had actually been arranged. In the particular cases under notice no inquiries had been made. There seemed little likelihood of an electricity supply being available in the Ryedale area for some years to come. The Rural Councils of the area and others where like incidents have occurred, have issued a warning to their ratepayers not to have their houses wired without consulting the officials of the Councils or of the Cleveland and Durham Company.

Electric Clocks Popular

At the conclusion of an address to members of the jewellery trade at Plymouth recently, Miss G. E. Francis, secretary to the National Association of Goldsmiths, was asked her opinion as to the future of electric clocks, and what effect they were likely to have upon the retail trade. Miss Francis said in her opinion the retailer would have to take up the electric clock very definitely or he would be left behind. She thought that the electric clock was going to become very popular in the near future. Other types would be gradually eliminated, and in the new houses that were erected electric clocks would probably be installed as part of the equipment. It might be ten years before there would be a really general demand for electric clocks, but it was her personal opinion that jewellers would be bound to take them up.

British Plant for Iraq

The Mosul correspondent of *The Times* reports that in face of foreign competition British firms have been able to secure all the contracts, amounting to £25,000, for putting into effect the electricity scheme of the municipality of Mosul.

Trade Commissioner's Visit

The Department of Overseas Trade announces that Mr. J. L. Wilson Goode, H.M. Trade Commissioner in the British West Indies, is now in this country on an official visit. Firms desiring interviews with him in London, or information regarding his arrangements to visit provincial centres, should apply to the Comptroller-General, Department of Overseas Trade, 35, Old Queen Street, S.W.1, quoting the reference 12456/1932.

Reclassification of Dumfries Undertaking

In response to the request of the Electrical Power Engineers' Association the Dumfries Town Council has agreed to the reclassification of the electricity undertaking (consequent upon the increased output) from Class A to Class B of the National Joint Board schedule.

New Method of Marking Pirelli-General Cables

To act as a safeguard against inferior cables being sold as of Pirelli-General make, it has been decided in future that all tough-rubber-sheathed cables in sizes up to and including 7/.064 in single, twin, and three-core construction, and all sizes of C.M.A. grade tough-rubber-sheathed flexible cords of Pirelli-General manufacture will be marked with the makers' name, grade and class.

New Showrooms at Doncaster

New electricity showrooms were formally opened on May 2nd by the Mayor of Doncaster. The showrooms have been established jointly by the Doncaster Corporation and the Electrical Distribution of Yorkshire, Ltd. Ald. H. M. Marshall, chairman of the Electricity Committee, said the consumers in Doncaster had increased from 877 in 1914 to 10,037 in the current year. Mr. R. Armitage, chairman of the Yorkshire Electric Power Co., said the cost of generating current was gradually going down, but there was a good deal of cost involved in distribution. It was only by co-operation and simplification that electricity could be distributed quickly all over the country.

Old-fashioned and modern lighting fittings compared at the I.C.I. Exhibition

Vacuum Cleaners

A sales lecture and demonstration to the trade of the "Mary Ann" electric vacuum cleaner is to be given at the Memorial Hall, Farringdon Street, E.C.4, on Tuesday, May 24th, at 8 p.m., by the British Electric Domestic Appliances, Ltd.

Trade with Yugoslavia

A confidential memorandum on the methods of quoting and terms of payment prevailing in Yugoslavia has been prepared by the Commercial Secretary to H.M. Legation at Belgrade and circulated by the Department of Overseas Trade to firms whose names are entered on its Special Register. British firms wishing to receive copies should apply to the Department, 35, Old Queen Street, S.W.1, quoting reference No. C.X.3874.

British Works Management Association

Mr. H. Bridge, assistant factory manager of the Columbia Graphophone Co., Ltd., gave an address on the subject of "Works Management and Commerce" at a meeting on May 5th of the British Works Management Association at the Birmingham Chamber of Commerce. He said that the works manager should be taken more into the confidence of boards of directors and allowed to participate more fully in their activities. It was essential that there should be the closest co-ordination between the production and commercial sides. Production must eventually govern the essentials of industry; progress pivoted round production in a much more important way than it did round finance. Discussing modern aspects of industry, he pointed out that in many productive enterprises the margin of profit was too small, and there was a tendency in some cases not to have sufficient regard for quality in material. Effective works management could make an undertaking; its function was definite and distinctive, and the status

of the position should be much higher than it was too frequently regarded.

New French Companies

Among the new electrical companies recently formed in France are the Société Général Technique (Sozete), Paris (17 Rue Legendre), to prepare schemes for electric power stations, and water supply undertakings; the Société d'Exploitation des Brevets "Isodio," Paris (146 Avenue des Champs Elysées), to manufacture electrical apparatus; and the Société des Forces Hydrauliques de Meuse (Fhym), Paris (8 Rue Baudiun), capital 6 million francs, to develop the water power resources in the Ardennes.

Czechoslovakian Machinery Imports

The imports of electrical machinery into Czechoslovakia during the three months ended March last attained a value of £419,550, as compared with £573,000 in the corresponding period a year ago.

An Ediswan Lighting Installation

The Spanish Congress Hall of the Blackpool Tower Co., at Blackpool Winter Gardens has recently been illuminated by a combination of different lighting methods. The accompanying

The lighting of the Spanish Congress Hall, Blackpool.

illustration of one side of the hall shows the "Toric" units and lanterns which have been installed by the Edison Swan Electric Co., Ltd.

Petter Exhibits at the Bath and West Show

The Bath and West Show this year is being held at Yeovil, and naturally Petters, Ltd., whose works are in that town, are well represented. One of the most interesting exhibits is the recently introduced "Universal" air-cooled petrol engine specially designed as a power unit for use in such machines as concrete mixers, hoists, pumps, and so forth. This engine, which is of the four-stroke magneto ignition type is made in two sizes, 4-b.h.p. twin cylinder and 2-b.h.p. single cylinder. One of these engines will be shown coupled to a dynamo with switchboard complete. The "M"-type paraffin or petrol engine with ball and roller main bearings is to be exhibited in three sizes—1½, 3 and 5 b.h.p. The largest engine on the stand will be a 40-b.h.p. atomic Diesel cold-starting heavy-oil compression ignition engine. This is one of a series which is made in sizes up to 400 b.h.p. The latest addition to this range (7-b.h.p. model) is also shown.

The "Exide" Convention

This year's "Exide" Convention will be held on June 14th, 15th, and 16th at Blackpool. The official Exide banquet will take place on June 15th.

E.D.A. Cooking Campaign

In connection with its electric cooking campaign, the British Electrical Development Association has now issued a 20-page photogravure booklet, a 30-in. by 20-in. poster, a poster stamp, and a well-illustrated handbook on "How to Demonstrate an Electric Cooker."

Electrical Production in Canada

The Dominion Bureau of Statistics at Ottawa, in a report on the electrical apparatus and supplies industry in Canada, 1930, reveals a decline of 8 per cent. in production during the twelve months. The total value of goods manufactured was $104,577,790 as compared with $113,796,002 in 1929. Of the 149 plants producing electrical apparatus and supplies, 107 are situated in Ontario. The total capitalisation of the industry in 1930 was $102,979,896, employés numbering 20,568. The principal item in the list of products is radio sets and parts, valued at $20,334,511, whilst the output of batteries and parts was valued at $6,712,880. The production of telephone materials totalled $11,034,184, and of transformers $7,924,837. Incandescent lamps and parts produced were valued at $5,096,868, and there was also a large production of wire and cable, the total being $17,436,080.

Electrical Manufacture in the U.S.A.

Statistics published in the April number of the *Nema Survey* disclose little change in the depressed state of affairs in the American electrical manufacturing industry. During January and February orders for a.c. motors (1-200 h.p.) received by members of the Association amounted in value to $1,865,744, or $1,522,410 lower than in the corresponding months of 1931, orders for d.c. motors (1-200 h.p.) falling from $1,130,455 to $401,657; fractional h.p. motors at $1,989,120 showed a decline of $913,166. There was a decrease from $140,789 to $59,631 in orders for indoor power switching equipment, while outdoor equipment declined from $430,206 to $201,772. Another poor feature of the market was electric furnaces, which fell from $176,775 to $69,011. Actually the trading conditions for 1932 compare even more unfavourably with those for 1931 than might be gathered from the above figures since the number of companies reporting was in most cases higher for this year than in 1931.

Belgian Foreign Electrical Trade

THE following statistics of the value of Belgium's electrical imports and exports in 1931 have been extracted from the recently issued foreign trade returns of that country. Increases or decreases compared with 1930 are also shown.

While Belgium exports more cable and insulated wire than she imports, it will be observed that she is still a much larger importer than exporter of electrical machinery and of a quantity of unspecified electrical apparatus. At the same time her exports of telegraph and telephone apparatus are still higher in value than her imports, although the latter showed as big an advance in 1931 as her exports showed a decline.

In 1931 the total value of imports of machinery, apparatus, railway material and electrical material, was 1,657,000 fr. and of exports of similar material 1,028,000 fr. Imports showed a decline of 790,660 fr. as compared with the preceding year, and exports a decline of 362,500 fr.

Imports

	1931. Francs. Thous.	Inc. or Dec.
Dynamo-electric machines—		
Total	103	− 77
From Germany	39	− 11
„ France	16	− 24
„ Sweden	14	− 21
„ Switzerland	16	− 12
Dry batteries—		
Total	7	—
From Germany	2	—
„ Denmark	4	—
Accumulators and plates—		
Total	7	+ 1
From United Kingdom	2	—
„ France	2	—
„ United States	2	+ 1
Cables, submarine and underground—		
Total	11	− 37
From Germany	10	− 29
Other insulated wire and cable—		
Total	13	− 12
From Germany	9	− 5
„ United Kingdom	1	− 1
Electrical carbons—		
Total	7	− 1
From Germany	3	+ 1
„ United States	2	− 2
Electrical apparatus not elsewhere specified—		
Total	181	− 95
From Germany	79	− 37
„ France	38	− 29
„ United Kingdom	11	− 8
Wireless valves—		
Total	21	+ 10
From Holland	15	+ 6
Insulators—		
Total	5	− 4
From Germany	2	− 1
„ France	3	− 2
Metal-filament lamps—		
Gas-filled Total	13	− 1
From Germany	2	− 2
„ Hungary	2	—
„ Holland	7	+ 1
Vacuum Total	24	− 4
From Germany	9	+ 2
„ Holland	9	− 5
Measuring instruments and parts—		
Total	18	− 6
From Germany	5	− 1
„ Switzerland	10	− 2
Telegraph and telephone apparatus—		
Total	119	+ 34
From Germany	46	+ 15
„ United States	18	+ 13
„ Holland	35	+ 6

Exports

	1931. Francs. Thous.	Inc. or Dec.
Dynamo-electric machines—		
Total	46	− 13
To Congo	7	+ 1
„ Argentina	5	—
„ Holland	5	− 4
Dry batteries—		
Total	3	− 1
To United Kingdom	2	− 1
Accumulators and plates—		
Total	11	—
To Holland	2	—
„ Argentina	—	− 1
„ Spain	1	—
Submarine and underground cables—		
Total	32	− 27
To United Kingdom	10	− 16
„ Holland	5	+ 1
„ Germany	4	− 3
Other insulated wire and cable—		
Total	44	− 10
To India	3	+ 2
„ Holland	5	− 2
„ United Kingdom	15	+ 1
Electrical apparatus not elsewhere specified—		
Total	42	− 3
To Holland	6	− 2
„ Switzerland	8	− 1
Metal-filament lamps—		
Total	22	+ 6
To Holland	4	− 1
„ United Kingdom	7	+ 5
Telegraph and telephone apparatus—		
Total	122	− 33
To China	7	− 10
„ Spain	5	− 12
„ Holland	14	− 2
„ Switzerland	25	+ 10

Recent Contracts

Batteries supplied by Hart Accumulator Co., Ltd., having capacities ranging from 300 to 700 Ah, are to be installed in the following automatic telephone exchanges in the Birmingham area: Four Oaks, Shirley, Priory, Halesowen, Tipton Solihull and Blackheath.

The Edison Swan Electric Co., Ltd., has received a contract from the Great Western Railway for twelve months' supply of lamps for train lighting.

Salford Corporation Tramways Department has placed an order with Siemens Electric Lamps & Supplies, Ltd., for twelve months' supply of traction lamps.

Among orders received by the British Thomson-Houston Co., Ltd., for Mazda lamps are supplies for the Admiralty, War Office, the London, Midland and Scottish, and the Great Western Railways, and Birmingham Corporation Tramways.

Trade Announcements

Owing to increasing business Messrs. Ellis & Ward have removed their Birmingham branch to larger premises at Tudor House, Livery Street, Birmingham.

The Enfield Cable Works, Ltd., has moved its Glasgow office to 260, St. Vincent Street, Glasgow, C.2. The telephone number will remain unchanged.

The Stanton Ironworks Co., Ltd., has taken over the London warehouse business in cast iron pipes and specials of Messrs. Fellowes, Williamson & Co., Ltd., Seagrave Road, Fulham, S.W. The company has also acquired a controlling interest in the Wellingborough Iron Co., Ltd.

Pending the formation of a company, Messrs. Parks (Manufacturers) are operating temporarily under the management of Miss Park (Miss Waller) at 60, Newman Street, W.1.

Messrs. Muller & Co. (England), Ltd., have removed to Sphinx Works, Chase Road, Park Royal, N.W.10. The telephone number is Willesden 7282-3.

Whitsun Holidays

The works and offices of Messrs. Higgs Motors, Witton, will be closed on Monday and Tuesday next.

The office of the Jackson Electric Stove Co., Ltd., 143, Sloane Street S.W., will be closed from 12.30 p.m. on May 14th until Wednesday, May 18th.

Reduction of Capital

In the High Court on May 3rd, Mr. Justice Maugham sanctioned a scheme of arrangement between Cammell, Laird & Co., Ltd., and the debenture stockholders and shareholders, reducing the company's capital from £4,500,000 to £998,144.

The Cheltenham All-Electric House

An all-electric house, organised by the local Circle of the E.D.A., has recently been opened at Cheltenham. It is an eight-roomed house comprising a kitchen, lounge, dining room, three bedrooms, a bathroom, and a room in the basement equipped with electrical laundry appliances. In each of the rooms electrical appliances to meet all requirements have been installed. An idea of the many uses to which electricity has been applied can be gathered from the accompanying illustration of the dining room in which it will be

[Cheltenham Newspaper Co., Ltd.

The dining room, Cheltenham all-electric house

seen that the electrical equipment includes an imitation coal fire, an electric kettle, a toaster, a floor standard, a warming plate, and an "all mains" receiver.

The Timber Market

Our Timber Trade Correspondent reports that market conditions of building timber varieties are showing improvement, but the demand generally is on the slack side, mainly owing to building trade quietness, and European suppliers are finding it necessary to lower quotations to secure business from British wholesalers. Inquiries for Eastern pine and British Columbia Douglas fir are increasing every day. Canada is doing more business with the United Kingdom in hardwoods this year. Empire mahogany, too, is more in request than any other mahogany, but the call for that wood is still quiet. Indian and Australian woods are in quiet demand. The duty of 20 per cent. on wood manufactures opens up great possibilities for cabinet makers here; in any increase in home manufacture Empire woods will figure more largely than heretofore.

For Sale

The factory of Garrard Gears (Manufacture & Sale), Ltd., at Dunstable, will be sold by auction by Leopold Farmer & Sons at 155, Queen Victoria Street, E.C.4, on May 24th.

D.c. generating plant is offered for sale by the Bournemouth & Poole Electricity Supply Co., Ltd.

Messrs. A. Webster, Ltd., are inviting offers for a quantity of electrical plant.

(See our advertisement pages to-day.)

Finalists for the Callender golf cup, presented by Mr. T. Petersen, at West Byfleet. The winner, Mr. J. Phillips, is fifth from the left in the front row

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, Etc.	Price May 11th.	Fortnight's Inc. or Dec.
a	Acid, Oxalic ... ... per lb.	5½d.	—
a	Ammoniac, Sal ... ... per ton	£60	—
a	Ammonia, Muriate (large crystal) ... ,,	£52	—
a	Borax ... ... ,,	£17	—
a	Copper Sulphate ... ... ,,	£25 10s.	—
a	Potash, Chlorate ... ... per lb.	3½d. to 4½d.	—
a	,, Perchlorate ... ... ,,	5½d.	—
a	Shellac T.N. ... ... per cwt.	£3 15s.	—
a	Sulphur Commercial ... ... ,,	£11	—
a	,, Roll ... ... ,,	£11	—
a	Soda, Chlorate... ... ... per lb.	3½d. to 3¾d.	—
a	,, Crystals... ... ... per ton	£5 to £5 5s.	—
a	Sodium Bichromate, casks ... ... per lb.	4d.	—
	METALS, Etc		
b	Aluminium, Ingots ... ... per ton	£95 to £100	—
b	,, Wire ... ... per lb.	1/1 to 1/9	—
b	,, Sheet and Foil ... ... ,,	1/1½ to 2/0	—
p	Babbits Metal and Anti-friction Metals—		
	Grade I ... ... per ton net	£117	£4 inc.
	Grade II ... ... ,,	£85	£2 inc.
	Grade III ... ... ,,	£51	—
c	Brass (rolled metal 2" to 12" basis)... per lb.	7d.	—
c	,, Tubes (solid drawn) ... ... ,,	9d. to 9½d.	—
c	,, Wire, basis ... ... ,,	7¾d.	—
c	Copper Tubes (solid drawn) ... ... ,,	9½d.	—
g	,, Bars best selected) ... ... per ton	£63	—
g	,, Sheet ... ... ,,	£63	
g	,, Rod ... ... ,,	£63	
g	,, (Electrolytic) Bars ... ... ,,	£37 10s.	10s. dec.
d	,, ,, Sheets... ... ... ,,	£68	—
d	,, ,, Wire Rods ... ,,	£41 10s.	10s. dec.
d	,, ,, H.C. Wire ... per lb.	6¼d.	—
f	Ebonite Rod ... ... ,,	1/3 to 1/6	—
f	,, Sheet ... ... ,,	1/3 to 1/6	—
n	German Silver Wire ... ... ,,	2/2	—
h	Gutta-percha, fine ... ... ,,	nom.	—
h	India-rubber, Para fine ... ... ,,	3¾d.	¼d. inc.
i	Iron, Pig (Cleveland No. 3) ... ... per ton	58/6	—
i	,, Wire, galve. No. 1, P.O. qual. ,,	£20	—
g	Lead, English pig ... ... ,,	£12 15s.	£1 dec.
g	Mercury ... ... per bot.	£16	£1 15s. dec.
e	Mica in original cases) small ... per lb.	6d. to 8/6	—
e	,, ,, medium ... ,,	4/– to 8/–	—
e	,, ,, large ... ,,	8/6 to 17/6 & up	—
p	Phosphor Bronze, plain castings ... ,,	1/1½d.	—
p	,, ,, drawn bars & rods ,,	11d.	—
p	,, ,, rolled strip & sheet ,,	10½d.	—
p	,, ,, wire ... ... ,,	11½d.	—
o	Platinum ... ... per oz.	£10 11s.	—
d	Silicium Bronze Wire... ... ... per lb.	7¾d.	—
r	Steel, magnet, in bars ... ... ,,	7¾d.	—
g	Tin, Block (English) ... ... per ton	£121 15s. to £123 15s.	£3 15s. inc.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	3/1	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Boiling & Lowe.
j Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

New Catalogues and Lists

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—Booklet No. M.6160, dealing with radio measuring instruments. Also the April issue of the "Osram-G.E.C. Bulletin," containing particulars of new developments in G.E.C. lighting fittings.

Donovan & Co., 46 & 47, Great Charles Street, Birmingham.—Publication No. 3221, describing conduit fittings.

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester.—A number of new and revised leaflets for insertion in the company's sectionalised catalogue. The subjects covered include various types of electric motors, arc welding equipments, central flow surface condensers, control gear, switchgear, instruments and meters.

Key Engineering Co., Ltd., 4, Queen Victoria Street, E.C.4.—An illustrated booklet giving particulars of the "Key" underfloor duct system of wiring.

Ferranti, Ltd., Hollinwood, Lancs.—Lists Nos. Wb 530, Wb 534, H.10 and H.12, describing respectively Ferranti a.c. mains radio receivers, moving-coil loud speakers, a 1½-gal. water heater and a new element for Ferranti fires.

Barker, Young & Co., Ltd., Broadwater Road, Welwyn Garden City.—A catalogue, illustrated in colour, relating to the "B.Y.C." system of heating buildings electrically.

British Insulated Cables, Ltd., Prescot, Lancs.—A folder on "Bulldog" black adhesive tape.

Ateliers de Constructions Electriques de Charleroi, 56, Victoria Street, S.W.1.—May stock list of electric motors, transformers, circuit-breakers, &c.

Siemens Electric Lamps & Supplies, Ltd., 38-39, Upper Thames Street, E.C.4.—An illustrated catalogue (No. 484) of decorative light shades, bowls, &c.

Bankruptcy Proceedings

W. L. Cornish (trading as the Modbury Electric Light and Power Supply Co.), electrician, 5, Church Street, Modbury, Devonshire.—The public examination was held recently at the Western Law Courts, Plymouth, when a statement of affairs was submitted which showed liabilities of £217, and there was an estimated surplus of assets of £21. The debtor stated that he went to Modbury about twelve months ago and installed a generating plant, as there was no electric lighting available in the village. He estimated that when the plant was installed it was worth £400. The examination was closed.

A. de Villiers (trading as the Castle Radio Manufacturing Co.), wireless and electrical manufacturer and dealer, 161, Westminster Bridge Road, S.E.—The statutory first meeting of creditors was held on May 5th at London Bankruptcy Buildings, a receiving order having been made on April 22nd upon the petition of Messrs. B. Zeitlin & Sons, Ltd. It transpired that the debtor had not attended under the proceedings and no information was available with regard to liabilities or assets. A resolution was passed for Mr. F. T. Smith (Miller, Smith & Co.), Southampton Row, W.C., to act as trustee and wind up the estate in bankruptcy.

A. Robson (Anson Radio), wireless engineer, 147, Dickinson Road, Rusholme, Manchester.—Public examination June 10th at the Court House, Quay Street, Manchester.

L. E. Cannon, electrical engineer, Room 327, Grand Buildings, Trafalgar Square, W.C.—Application for discharge to be heard on June 1st at Bankruptcy Buildings, Carey Street, W.C.

B. Marsh, electrician, 17, Victoria Road, Brighton.—Discharged subject to consenting to judgment being entered against him for £50 and £1 10s. costs. £50 paid to the Official Receiver in lieu of entering up judgment.

J. Kirk, electrical engineer, 2, Park Villas, Malden Road, Cheam.—Trustee, Mr. C. R. Waterer, 29, Russell Square, W.C., Official Receiver, released April 29th.

D. L. Gibson (James Rush & Co., and the Hadrian Engineering Co.), wireless retailer and manufacturer, 31-33, Westgate Road, Newcastle-upon-Tyne.—Last day for receiving proofs for dividend May 24th. Trustee, Mr. R. M. Graham, 2, Saville Place, Newcastle-upon-Tyne.

Company Liquidations

British Aerotechnical Co., Ltd.—Winding up voluntarily. Liquidator, Mr. A. H. Partridge, 3, Warwick Court, Gray's Inn, W.C.

Walsall Electrical Co., Ltd.—Particulars of claims by May 31st, to the liquidator, Mr. P. Cozens, Midland Bank Chambers, Walsall.

Jaxons, Ltd.—Particulars of claims by May 21st to the liquidator, Mr. F. W. Davis, 28, Theobald's Road, W.C.

Louth Electric Service, Ltd.—Particulars of claims by May 23rd to the liquidator, Mr. C. Turner, 155, Norfolk Street, Sheffield.

W. R. Bottomley & Co., Ltd., and **Electric Motor Supplies, Ltd.**—Meetings June 13th, at 78, John William Street, Huddersfield, to receive an account of the winding up by the liquidator, Mr. F. White.

Robersons, Ltd.—Winding up voluntarily. Joint liquidators, Mr. P. B. Addington, 80, Bishopsgate, E.C., and Mr. C. J. G. Palmour, 4b, Frederick's Place, Old Jewry, E.C.

Winding-up Petitions

Kinson Electrical Co., Ltd.—In the Company's Court, Chancery Division, on May 9th, Mr. Justice Maugham made an order for the compulsory winding up of Kinson Electrical Co., Ltd., on the petition of Sloan Electrical Co., Ltd. Counsel said the petitioners were creditors for £8,400. The company did not appear and there was no opposition.

Selectors (1931), Ltd.—In the Company's Court, Chancery Division, on Monday, Mr. Justice Maugham had before him a petition by General Electric Co., Ltd., for the compulsory winding up of Selectors (1931), Ltd. Counsel for the petitioners said his clients were creditors for £36 and there were supporting creditors. He understood there was to be a meeting of the company and of the creditors and he asked for the petition to stand over till the second petition day in next sittings. There was no opposition and his lordship directed accordingly.

Electricity Supply

Lighting, Domestic, Power

Ampthill.—SUPPLY TO VILLAGES.—The Rural District Council has been informed by the Luton borough electrical engineer that a scheme for the transmission line to Pulloxhill, Flitton, Susoe, Gravenhurst, Higham Gobion, and Shillington is well in hand, and that all the villages will be supplied as soon as there is reasonable evidence that a supply is required.

Argentina.—ROSARIO.—The output of the power station of the Société d'Electricité de Rosario during last year amounted to 84,177,383 kWh, as compared with 81,447,669 kWh in 1930. The number of consumers increased from 53,921 to 56,182.

Banff.—LIGHTING OF CAMPBELL HOSPITAL.—The County Council is to install electric lighting at the Campbell Hospital, Portsoy, at a cost of £655.

Barrow-in-Furness.—OVERHEAD LINES APPROVED.—The Minister of Transport has approved the erection of overhead lines to supply Upper Holker, Broughton East, Colton, and Staveley.

Bradford.—NEW SUB-STATION.—The Electricity Committee is to erect a sub-station at Idle at a cost of £2,600.

Burton-on-Trent.—POWER CHARGES.—The Electricity Committee has notified all consumers that in future the minimum charge for power will be £1 per annum. Mr. T. Hall, the borough electrical engineer, states that many people were asking for power meters to be put in merely for radio receivers, the consumption of which was so small that the revenue would not cover the capital charges of installing the meter.

Canada.—THE BEAUHARNOIS SCHEME.—According to *Power*, the Canadian Government is to guarantee the $7,957,000 advanced by banks against first mortgage bonds on the works under construction and is also prepared to advance $15,000,000 toward completing the project, which is estimated to cost $55,000,000. Some of the larger private investors in the enterprise and the banks will together furnish the remainder required, and the government of Quebec will forego its right to $1,500,000 in taxes up to 1937, when the work should be completed for delivery of more than 1,000,000 h.p. The Government of Canada is not, however, prepared to guarantee the interest on $30,000,000 second debenture bonds defaulted on April 1st.

PROPOSED DEVELOPMENTS IN MANITOBA.—The diversion of the Saskatchewan River to provide for a 400,000-h.p. hydro-electric development in northern Manitoba now appears more feasible than ever, the Minister of Natural Resources told the Manitoba Legislature recently. Survey parties were at work in the area all last summer, and other parties will be sent out shortly. The scheme involves the diversion of the flow of the river southward through Lake Manitoba and thence to Lake Winnipeg, and the creation of a number of new lakes.

ST. LAWRENCE WATERWAY.—A conference held last week at Ottawa between Mr. Henry, the Premier of Ontario, and Dominion Ministers brought to a successful conclusion the negotiations relating to power development on the international section of the St. Lawrence waterway. *The Times* says that an agreement has been reached whereby Ontario undertakes to contribute $120,000,000 to the cost of the joint power and navigation works in this section, and in return will receive Canada's half-share of the 2,000,000 h.p. to be developed. Money will be raised by the Hydro-Electric Commission, whose bonds the Province guarantees, but it will not be expended in a lump sum, as the installation of power equipment will be gradual, according to the demand for power. A decision has also been reached that power development shall be undertaken by the two-stage plan, a concession by the United States, whose engineering experts favoured the one-stage plan. Press dispatches from Washington indicate that the Hoover Administration is disappointed with the attitude adopted by the Canadian Government.

Colchester.—CANVASS OF BRANTHAM AREA.—At a recent meeting of the Electricity Committee, the consulting engineer reported on the advisability of constructing a transmission line from East Bergholt to Brantham, which would afford an alternative means of supply to premises at Brantham. The borough electrical engineer was asked to have a canvass made and to report the results to a future meeting.

EXTENSIONS.—Sanction is to be sought to a loan of £9,168 for the extension of transmission lines.

Continental.—GERMANY.—The output of the 122 principal electricity supply undertakings in Germany during January amounted to 1,138,000,000 kWh, as against 1,357,000,000 kWh in the corresponding month last year.

Dartford.—MAINS EXTENSION.—The Electricity Committee is to extend mains at a cost of £500 to supply the Heath Lane Estate and other places.

Dewsbury.—CHEAP ELECTRICITY FOR DEMONSTRATION PURPOSES.—The Electricity Committee has agreed to supply electricity to electrical contractors for purposes of demonstrating and heating in showrooms, at the rate of 1d. per kWh.

East Cornwall.—SPECIAL ORDER REFUSED.—As a result of the St. Austell and District Electric Lighting & Power Co.'s opposi-

tion before a Select Committee of the House of Lords, the East Cornwall Special Order promoted by the East Cornwall Electricity Supply Co., Ltd., will not now be confirmed.

Edmonton.—STREET LIGHTING INQUIRY.—A public inquiry was held last Friday into the Urban District Council's application for sanction to a loan of £2,200 for lighting improvements on the main road to Cambridge.

Gravesend.—MAINS EXTENSIONS.—The Corporation is to extend mains at a cost of £885.

Guildford.—NEW TWO-PART TARIFF.—The Town Council has adopted an alternative two-part tariff for lighting, heating, and domestic purposes for private houses, based upon floor area. The existing two-part tariff is based upon rateable value.

LOANS.—Application has been made for sanction to loans of £5,000 for meters, £6,000 for the assisted wiring scheme, and £8,930 in connection with the change-over in the outskirts of the town.

Haworth (Yorkshire).—CHEAPER ELECTRICITY.—The Urban District Council has reduced its lighting flat rate from 6d. to 5d. per kWh.

Hull.—POWER STATION ALTERATIONS.—Certain alterations costing approximately £11,588 are considered necessary to the switchgear and busbar section at the generating station.

Ilfracombe.—THE COUNCIL'S PURCHASE OPTION.—The Urban District Council has decided to defer until September the consideration of the question of exercising its powers to purchase the local electricity undertaking.

Japan.—ELECTRICAL DEVELOPMENT SCHEMES.—The Yahagi Hydro-Electric Co. has decided to proceed with the erection of its 52,000-kW Taifu power station, which is estimated to cost over 10,000,000 yen. The installation of an additional 35,000-kW turbo-generator at the Shikama No. 3 power station is also being considered by the Sanyo Central Hydro-Electric Power Co.

Liverpool.—SUB-STATION EQUIPMENT.—Sanction has been received to the equipment of sub-stations at Croxteth Hall Farm and Collingwood Dock.

London.—WANDSWORTH.—The London Electric Supply Corporation is to erect transformer sub-stations at Jews Row and Tooting High Street, and also transformer chambers at Priory Lane, Putney, and Blakenham Road, Tooting. Mains are also to be laid by the company in twenty-nine thoroughfares in the borough.

Manchester.—BOILER PLANT IMPROVEMENTS.—Mr. H. C. Lamb, city electrical engineer and manager, reports that the demand on the power stations is increasing, but, owing to the obsolescence of some of the boilers—installed thirty years ago—it is not possible to obtain the maximum output of the turbo-alternators at Stuart Street. The fourteen land-type boilers are unreliable when steamed at full pressure, and he considers that it is advisable to remove eight of these, replacing them by two new boilers, each having an evaporation of 100,000 lb. per hour. The space cleared would allow of the installation of two further boilers of the same size, should this be desired at a later date. The total capacity of four new boilers would thus be 400,000 lb. of steam per hour, against 160,000 lb. per hour for the existing eight old-type boilers. The cost of the new works now proposed, including two boilers, air-heaters, draught fans, soot and ash removal plant, together with building alterations, is estimated at £75,000.

Newcastle Emlyn (Card.).—A SUPPLY SCHEME.—Steps are being taken by the West Cambrian Power Co., Ltd., to give a supply of electricity in the area of the Rural District Council. The work will be commenced immediately wayleaves have been secured.

New Zealand.—PROGRESS AT ARAPUNI.—Satisfactory progress is being maintained with the work of reconditioning the Arapuni hydro-electric plant. The concreting of the head-race, which conducts the water from the dam to the penstocks, has been completed for a length of 1,550 ft., heavy concrete walls having been erected along the overflow channel leading from the spillway weir. The floor of the channel has been laid in concrete, and extensive concreting work is being carried out at the waterfall, with a view to preventing the serious erosion of rock which formerly caused anxiety. The surplus water from the head-race, instead of descending in one fall to the pool below the waterfall, will have a two-stage drop in order partially to break the impact of the water, the initial fall being 60 ft. and the second 100 ft. Extensive experiments with small-scale models were carried out by the Public Works Department in order to determine the most suitable design for this portion of the work. The erection of No. 4 turbine and auxiliary plant is in progress, and it is expected that the station will again be in operation by next month.

Nuneaton.—LOAN SANCTIONED.—The Town Council has received sanction to the borrowing of £10,000 for mains and services.

Oldham.—SUCCESS OF TRADES EXHIBITION.—Satisfaction with the results of the recent trades exhibition held in the town was expressed by the chairman of the Electricity Committee at a recent meeting. Apart from a substantial increase in the sales of electrical energy, in the course of a fortnight twenty-five electric cookers and twenty-four washboilers had been let out on simple hire, and sixty-eight vacuum cleaners had been sold. Sales of electrical energy were 474,116 kWh above the figure for the corresponding fortnight of last year.

Romney Marsh.—A SUPPLY IN THE AUTUMN.—As a result of a conference between representatives of the local authorities in Romney Marsh and of the Kent Electric Power Co., Ltd., it is hoped that a supply of electricity will be available by the autumn.

St. Austell.—EXTENSIONS.—The St. Austell and District Electric Lighting & Power Co., Ltd., is to proceed immediately with the extension of its mains to St. Dennis, in accordance with its scheme to carry a ring-main *via* St. Dennis and St. Stephen, thus joining up with the extension recently made in the Gover Valley.

Snaith (Yorks).—PREPARATIONS FOR SUPPLY.—The Yorkshire Electric Power Co. has commenced the laying of cables for a supply of electricity to the town.

Southport.—LOANS.—The Electricity Committee is to make application for sanction to a loan of £6,500 for a new e.h.p. feeder for connecting up the generating station with the Market Hall sub-station. Borrowing powers for £13,000 for mains and sub-station equipment have just been obtained.

Stewartry.—ACQUISITION OF UNDERTAKINGS.—At a recent meeting of Stewartry County Council at Kirkcudbright the Electricity Committee reported on negotiations with the Dalbeattie Electric Light & Power Co., Ltd., regarding the taking over by the County Council of its undertakings at Dalbeattie and Gatehouse. On behalf of the company it was stated that the sum offered could not be accepted and that the offer of arbitration would be considered, but, in the position which had now been reached, the company would probably prefer to have the matter dealt with by a public inquiry to be held by the Electricity Commissioners. The Council agreed that a communication should be sent to the Electricity Commissioners reporting the action which had been taken, for the purpose of dealing with the objections made by the Dalbeattie Co., and to ask the Commissioners to dispose of these on the ground that the Council was prepared to adjust matters with the company on the terms offered it.

SUPPLY TO KIRKCUDBRIGHT.—Arrangements have been made with the Central Electricity Board for a supply of electricity for Kirkcudbright by the erection of an overhead line from Kilmarnock and Tongland.

Stockton-on-Tees.—VOLTAGE REGULATION.—The Electricity Committee is considering the provision of a voltage regulator in connection with the supply to Egglescliffe Village.

LIGHTING OF MARKET.—The borough electrical engineer has been instructed to prepare and submit a scheme for lighting the market stalls by electricity.

Stoke-on-Trent.—LOAN SANCTIONED.—The Electricity Committee has received sanction to a loan of £10,000 for alterations and additions to switchgear and for part of the cost of a new switch house.

Sutton Coldfield.—MAINS AND SERVICES.—The Town Council is to apply for sanction to a loan of £25,000 for prospective expenditure on mains and services. The electricity output for the year ended March 31st last showed an increase of 19½ per cent.

Tavistock.—SUPPLY FOR HOUSING ESTATES.—The Urban District Council has given permission to the West Devon Electricity Supply Co. to extend mains through the Crelake Park and Whitham Park Housing Estates.

Tilbury.—LOAN SANCTIONED.—The Urban District Council has received sanction to the borrowing of £5,500 for mains and services, plant and meters. A further thirty-nine applications for installation have been received, and sanction is to be sought to borrow the amount required for the purpose.

Uttoxeter.—ELECTRICITY FOR ROCESTER.—The Urban District Council has decided to extend the supply of electricity to Rocester at an estimated cost of £3,670.

Wallsend-on-Tyne.—PUBLIC LIGHTING IMPROVEMENTS.—The Town Council is to consider the improvement of the public lighting of the High Street.

CABLE EXTENSIONS.—The Council has approved plans by the Newcastle-on-Tyne Electric Supply Co., Ltd., for l.p. underground cables in Regent Road, Station Road, Princes Road, and Coronation Road.

Wolverhampton.—IMPROVEMENT AND EXTENSION SCHEMES.—The Electricity Committee is to replace old mains and change over the system in the Salop Street and Worcester Street districts at a total cost of £26,146. A sub-station is to be erected on the Low Hill Estate, and a supply is to be provided to the new Gaumont Palace, Snow Hill, at a cost of £788.

Workington.—CONSUMERS' DEPOSITS.—The Finance Committee recommends the relaxation, in cases where the financial position of the consumer is satisfactory, of the rule requiring deposits from electricity consumers. Old consumers are to be at liberty to apply for repayment of their deposits.

Worthing.—BULK SUPPLY AGREEMENT.—The Electricity Commissioners have given approval to the agreement between the Town Council and the Shoreham & District Electric Lighting & Power Co., Ltd., for a bulk supply to the Corporation.

Traction

Barrow-in-Furness.—TRAMWAY ABANDONMENT.—The Minister of Transport has granted the Corporation permission to abandon tramways on various routes.

Continental.—SPAIN.—A review of railway electrification in Spain, published in *Modern Transport*, reveals the rapid progress which has been made in this direction during the past ten years. Of nearly 900 km. of line actually in service, 700 km. have been completed during that period. Nearly 800 of the 890 km. electrified are supplied with d.c., and of these 579 km. are supplied at 1,500 V, 118 km. at 3,000 V, and 81 km. at 1,200 V. There are 16 electrified sections of line (owned by 13 different railway companies) over a distance of 890 km., and there are in service approximately 90 locomotives and 160 motor cars. Taking into consideration the fact that the Spanish railways in 1930 covered a distance of 16,689 km., and that conditions in Spain are extremely adaptable to electrification, it will be seen that there is still room for further expansion. By Royal Order of January 14th, 1928, a Commission was nominated to study the whole question of railway electrification. The study showed that some 5,700 km. could be proceeded with at once or should be studied closer. In accordance with the above, it was announced in the daily Press that the Government had decided to carry out an extensive programme of railway electrification, commencing with 1,500 km. A Royal Decree of July 23rd, 1929, nominated a special Commission under the Ministry of Public Works to supervise the work. This Committee still exists, although the change in the political situation prevented the programme being carried out. Previous to the official intervention, several railway companies had carried out detailed studies for the electrification of sections of their lines. In view of the official programme, these studies were hurried forward and others started, with the result that in 1929 numerous projects were completed, details of which are as follows: The Compania del Norte: Madrid-Avila and Villalba-Segovia, 183 km.; Bilbao-Miranda, 104 km., and Encina-Valencia-Castellon, 192 km.

Rochdale.—TRAMWAY ABANDONMENT PROPOSALS.—The Town Council is considering the abandonment of further tram routes. It is expected that within three months no trams will be running in the town.

Southport.—BUSES TO REPLACE TRAMS.—The Town Council has decided to replace the trams on the Roe Lane route by buses as soon as the necessary vehicles can be obtained.

Sunderland.—RECONSTRUCTION OF TRACK.—Sanction to a loan of £8,000 has been applied for by the Town Council for the reconstruction of the tramways in Ryhope Road.

Traffic Signals.—NEW INSTALLATIONS.—The installation of automatic traffic signals is being considered at Watford, Nantwich, and East Ham (£1,500).

Communications

Canada.—STATE BROADCASTING.—The Committee of the House of Commons, which has been investigating the control of broadcasting, has completed a unanimous report which will be tabled this week. The report virtually endorses the scheme of the Canadian Radio League, and recommends that broadcasting be treated as a national monopoly and placed under the control of a Federal Commission of three or five members vested with wide powers, says *The Times*. But in view of the financial situation the Committee does not recommend that there should be any immediate large programme of development involving a heavy outlay. It suggests that it should be left to the Commission to frame a policy with regard to existing stations, which might be taken over for part or full time, and to arrange for the gradual development of additional facilities as financial conditions improve. The plan of the B.B.C. is to be taken as a model, and the Commission will be financed out of licence fees.

China.—LONG-DISTANCE TELEPHONY.—The Hong Kong-Canton telephone cable is China's first long-distance loaded telephone cable. This modern cable was manufactured in the Woolwich factory of Standard Telephones & Cables, Ltd., for the China Electric Co., Ltd., which received the order from the Municipality of Canton and the Hong Kong Telephone Co., Ltd. An interesting article describing the cable, the work of laying it, and the inauguration of the new long-distance telephone service appears in *Electrical Communication*. The cable is 116 miles in length, although Hong Kong and Canton are only about 85 miles apart, the greater length of the cable being accounted for by the topographical barriers of the country, which made the installation and transport of the cable very difficult. The installation was carried out with English testers supplied by Standard Telephones & Cables, Ltd., and Chinese jointers.

Denmark.—THE KALUNDBORG BROADCASTER.—It is now possible to supplement the brief details originally announced of the order which the Danish Government has placed with Standard Telephones & Cables, Ltd., for a new high-power broadcasting station for Kalundborg. The new broadcaster will have an unmodulated carrier power of 60 kW, and will operate on a wavelength of 1,153 metres. Straight-line modulation up to 95% will be possible with this equipment and, as the frequency response characteristic of the broadcaster will be flat (within 3 db) between 30 and 10,000 cycles, the quality of transmission will be very good. The last stage will utilise two water-cooled valves, each rated at 120 kW, working with an anode voltage of 20,000 V. The transmitter will have a specially constructed quartz crystal oscillator which will keep the carrier frequency correct to within 13 cycles per second. The 20,000-V power supply will be obtained from hot cathode mercury vapour rectifiers.

Great Britain.—RADIO EXCHANGES.—The Works Committee of the Plymouth City Council has given permission for a wireless relay system to be started in the city by Rediffusion, Ltd., the licence to be for a period of ten years.

Lewes Town Council has decided not to allow Broadcast Listeners' Service, Ltd., to establish a local service.

The Sentinel Electric Co. has applied to the Bromley (Kent) Town Council for permission to install a service. A sub-committee is considering other similar applications.

Faversham Town Council has granted permission to the Kent Relay Service to establish a wireless exchange in the town. A similar application by Broadcast Listeners' Service, Ltd., has been refused.

Mr. T. C. Gilbert's application to the Folkestone Town Council on behalf of a local company has been granted.

Irish Free State.—NEW BROADCASTING STATION.—The transmitter for the new Irish high-power broadcasting station which has been ordered by the Irish Free State authorities from Marconi's Wireless Telegraph Co., Ltd., is expected to be in operation towards the end of June, and is shown in our illustration undergoing final tests at the company's works at Chelmsford. Moydrum, 2¼ miles east of the town of Athlone, is the site for the station, which will have an unmodulated aerial energy of 60 kW with modulation up to 80 per cent. The power of the transmitter can be doubled at a later date and it can be adjusted to work on any wavelength between 300 and 550 metres; it is expected to operate, however, on 413 metres, the wavelength at present used by the Dublin broadcasting station. Low power modulation is employed, while the frequency is controlled by a Marconi oscillating quartz crystal drive, thermostatically controlled. The transmitting apparatus consists of six totally enclosed units constructed of aluminium panels with glass fronts. The aluminium panels, which are sprayed with grey cellulose lacquer, are framed in polished aluminium borders. A control table of similar finish is placed in front of the units. The main power stages as well as the intermediate stages are fitted with large water-cooled valves, while air-cooled glass valves are used in all the other stages. The aerial at Moydrum will be of the "T" type suspended between two stayed insulated masts, each 100 metres in height and about 225 metres apart.

The new I.F.S. broadcasting plant undergoing final tests

London.—RAILWAY TELEPHONY.—The London, Midland & Scottish Co., Ltd., has recently carried out a decentralisation scheme designed to establish more intimate relations between the company and its clientele, there now being some twenty divisional and district officers throughout the system. These officers in turn supervise the 2,500 odd stations on the company's system, as regards both passenger and goods traffic. The problem of linking stations with local officers, and local officers with headquarters, is being solved by expanding the already considerable private telephone system of the L.M.S., utilising carrier trunk circuits, by means of which as many as three additional speech channels will be provided over an existing physical pair of wires. The principal additions to the existing trunk system, which will be completed during the present year, will consist of fourteen carrier trunk and fifteen physical circuits. These trunks will be connected to the existing L.M.S. telephone exchanges, to which all departments have access, and will form part of the company's equipment for dealing with its heavy summer passenger traffic in 1932. A traffic inquiry at a station on which advice or instruction may be required will admit of an answer being obtained in the minimum of time, even should a reference to headquarters be involved.

Russia.—COMMUNICATION WITH GREAT BRITAIN.—A public telephone service has been established between this country and Russia. The service is available to all parts of Great Britain and Northern Ireland, but in Russia it is restricted, at present, to Moscow.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Angus.—May 20th. County Council. Electrical work for 40 houses near Dundee. County clerk, Forfar (£1 1s. deposit).

Australia.—MELBOURNE.—May 31st. Posts and Telegraphs Department. Metal jointing sleeves. (G.X. 11463.)*

Belgium.—LIEGE.—May 15th. Société Anonyme des Tramways Unifiés de Liége et Extensions. Trolley buses. (G.X. 11389.)*

Cardiff.—May 25th. Electricity Department. E.h.p and l.p. cables. (May 6th.)

Chefting Wycombe.—May 23rd. Town Council. Electrically driven pumping plant for Pann Mill waterworks. Mr. W. Vaux Graham, 5, Queen Anne's Gate, S.W.1 (deposit, £5).

Dumfries.—May 21st. County Council. Twelve kiosks. (May 6th.)

East Lothian.—May 14th. County Council. Various works, including electric lighting, at new police station, North Berwick. Messrs. Dick, Peddie & Walker Todd, 8, Albyn Place, Edinburgh (deposit £2 2s.).

Eccles.—May 28th. Electricity Committee. Metal-clad transformer and ring-main e.h.p. switchgear control unit. Borough electrical engineer, Electricity Offices, 1, King Street.

Galloway.—May 31st. Galloway Water Power Co. Construction of Tongland Dam. Sir Alexander Gibb & Partners, Queen Anne's Lodge, Westminster, S.W.1 (deposit £10 10s.).

Glasgow.—May 23rd. Electricity Department. Cables, flexibles, cookers, kettles and cable covering tiles. (May 6th.)

May 25th. Education Department. Electrical work at Lambhill Street School. Education Office, 129, Bath Street (deposit £1 1s.).

Greece.—ATHENS.—June 1st. Greek State Railways. Diesel or Diesel-electric standard gauge rail coaches. (G. 11410.)*

India.—SIMLA.—May 18th. Indian Stores Department. Wall plugs and ceiling roses. (A.X. 11340.)*

Liverpool.—Electric Power and Lighting Committee. 12-kVA transformers.

London.—May 20th. South Indian Railway Co., Ltd. Copper wire, electric cables and accessories. Particulars from company's offices, 91, Petty France, Westminster, S.W.1. (fee 5s.).

CENTRAL ELECTRICITY BOARD.—June 6th. 33-kV switchgear for the South West England and South Wales Scheme. (See this issue.)

Manchester.—June 6th. Electricity Committee. Automatic telephone equipment at the Dickinson Street Offices and Polygon Depôt. (See this issue.)

New Zealand.—WELLINGTON.—June 22nd. Post and Telegraph Department. Insulators. (A.X. 11335.)*

Northern Ireland.—BELFAST.—May 17th. Tramway Department. 500-kW rotary convertor. (May 6th.)

Salford.—May 19th. City Council. Electrical installation in 96 houses, Wheaters Field, Lower Broughton, and in 84 houses, Gerald Road, Lower Broughton. City electrical engineer, Electricity Offices, Frederick Road.

May 25th. Education Committee. Electric lighting installations at Pendleton High School for Girls, Eccles Old Road, Pendleton. Director of education, Education Offices, Chapel Street.

South Africa.—JOHANNESBURG.—May 26th. City Council. Transformers (A.X. 11329) and traction lamps (A.X. 11330.)*

Southend-on-Sea.—May 19th. Corporation. Traffic control signals. (May 6th.)

Tilbury.—May 30th. Urban District Council. E.h.p. and l.p. cables, switchgear and kiosks. (May 6th.)

Uruguay.—MONTEVIDEO.—July 11th. National Administration of the Port. Electrically operated goods lifts and cranes. (A.X. 11338.)*

Wakefield.—Corporation. Electrical installation, including lighting, telephones, bells and radio equipment, in connection with erection of municipal hospital, Snapethorpe. Mr. L. Ives, city surveyor, Town Hall (deposit £5).

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Ashton.—Town Council. Accepted. Automatic traffic control signals (£240).—Forest City Electrical Co., Ltd.

Barrow-in-Furness.—Town Council. Accepted. L.p. cable (£927).—British Insulated Cables, Ltd. Meters for period ending March 31st, 1933.—Landis & Gyr, Ltd.; Ferranti, Ltd.; Metropolitan-Vickers Electrical Co., Ltd.

Burnley.—Sewerage Committee. Accepted. Gas engines, alternators and auxiliary plant at sewage works in connection with the generation of electricity (£3,250).—National Gas Engine Co., Ltd.

Carlisle.—Housing Committee. Accepted. Wiring houses on Council estates.—W. Batey & Sons; R. M. Hill & Sons; J. Queen.

Electricity Committee. Accepted. Supply of transformers for twelve months.—Brush Electrical Engineering Co., Ltd.

Eccles.—Electricity Committee. Accepted. 35 Wembley lanterns (34s. 6d. each).—General Electric Co., Ltd. 153 time switches (47s. 6d. each).—Horstmann Gear Co.

Gillingham.—Electricity Committee. Recommended. Rotary convertor for use in connection with electric crane at the pier (£411).—Crompton Parkinson, Ltd.

Leeds.—Electricity Committee. Accepted. Cables.—W. T. Henley's Telegraph Works Co., Ltd. (£150); Edison Swan Cables, Ltd. (£528); Macintosh Cable Co., Ltd. (£468).

London.—HAMMERSMITH.—Borough Council. Accepted. Installation of rising mains at the Guinness Trust Buildings, Fulham Palace Road (£450).—Wilkins Electrical Works, Ltd.

WANDSWORTH.—Borough Council. Electric lighting fittings for the new swimming baths being erected in Clapham (£607). —Alpha Manufacturing & Electrical Co., Ltd.

Mansfield.—Notts County Council. Accepted. Provision at sanatorium of new generating plant consisting of two 15-kW Diesel sets and accessories (£887).—R. A. Lister & Co., Ltd.

Portland.—Urban District Council. Accepted. Switchgear.—Crompton Parkinson, Ltd. Cables for the extension to Weston and Southwell.—Pirelli-General Cable Works, Ltd.

Portsmouth.—Electricity Committee. Accepted. Three 100-kVA transformers (£64 10s. each).—Johnson & Phillips, Ltd.

Rawtenstall.—Electricity Committee. Accepted. Switchgear for power station.—Metropolitan-Vickers Electrical Co., Ltd.

South Shields.—Town Council. Accepted. Installation of electric lighting in 96 houses on the Egerton Road Estate.—E. T. Sturgeon.

Watford.—Town Council. Accepted. Moore & Knight's coded fire alarm system (£1,323).—Walters' Electrical Manufacturing Co., Ltd.

Wolverhampton.—Electricity Committee. Accepted. Circuit breakers (£327).—George Ellison, Ltd. Switch unit (£188).—Ferguson, Pailin, Ltd. Two transformer groups (£303).—Hackbridge Electric Construction Co., Ltd. Transformers, four 50-kVA (£180), two 200-kVA (£174), and one 50-kVA (£45).—Metropolitan-Vickers Electrical Co., Ltd. Three 500-kVA (£466), and one 300-kVA (£107).—Electric Construction Co., Ltd. Switchboards (£417), switchboard and isolators (£182), and twelve 25-kVA and four 10-kVA transformers (£500).—Crompton Parkinson, Ltd.

Worthing.—Electricity Committee. Accepted. Providing and laying feeder cables (£5,598).—Callender's Cable & Construction Co., Ltd.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of the makers of the following:—

UNION motor.
O.E.C. bakelite switch.
LAUDATONE amplifier.
TERRY'S patent attachment for electric switches.
MARBO electric switches.

Forthcoming Events

Institution of Electrical Engineers.—(*Scottish Centre*).—Friday, May 13th, Cowdray Hall, Aberdeen. 7.30 p.m. Faraday Lecture, "Everyday Uses of Electricity." Prof. J. K. Catterson-Smith. (*Mersey and North Wales (Liverpool) Centre*).—Wednesday, May 18th. Benevolent Fund golf competition. (*Irish Centre (Dublin)*).—Saturday, May 21st. Trinity College, Dublin. 7.45 p.m. Annual general meeting.

Overhead Lines Association.—Wednesday, May 18th. Institution of Electrical Engineers, London. 5.30 p.m. Discussion on "Rural Transformers." Opened by Mr. W. Fennell.

Physical Society.—Friday, May 20th. Imperial College of Science, South Kensington, S.W. 5 p.m. Short papers.

Tramways, Light Railways and Transport Association.—May 18th-20th. Hotel Victoria, W.C. Annual Congress.

Institution of Electrical Engineers.—May 30th-June 3rd. Harrogate. Summer meeting. (*Western Centre*).—May 20th-23rd. Ledbury Park, near Chepstow. Summer meeting.

Incorporated Municipal Electrical Association.—June 15th-18th. Cardiff. Annual convention.

Municipal Tramways and Transport Association Inc.—June 22nd-24th. Grand Hotel, Eastbourne. Annual conference.

Electrical Contractors' Association.—June 28th-30th. Southport. Annual convention.

Overhead Lines Association.—July 1st. Chesham. Summer meeting.

A Portable Surge Generator

The Duquesne Light Co., of Pittsburgh, U.S.A., has placed in service a portable surge generator suitable for use in the field as well as the laboratory. The apparatus is mounted on a truck and consists of a rectifier and transformer enabling banks of condensers to be charged from a 110-V a.c. supply. The apparatus is rated at 750 kV with a capacity of 0.0145 micro-farad. The condensers are connected in the usual Marx circuit whereby they are discharged in series by means of interconnected spheres. The breakdown of one gap throws increased potential on the next gap, which forthwith breaks down. The breakdown action propagates through the entire system of condensers in less than a millionth of a second.

Notes

Electrically Operated Bridge at Liverpool

We illustrate on page 703 a 680-ton electrically operated balanced bascule bridge which has just been opened at one of the Liverpool central docks, the energy required being supplied by the Corporation Electricity Department. In calm weather the operation of opening or closing the bridge is completed in a minimum of 1¼ minutes. For use in case of breakdown, hydraulic motors have been provided as an alternative means of operating the spans, and emergency hand gears are also part of the equipment.

Speaking at the opening of the bridge, Mr. R. D. Holt, chairman of the Mersey Docks and Harbour Board, said that electric power was of immense importance to the trade of the port, and more and more the working of the docks was changing over from the old hydraulic system, instituted over forty years ago, to the utilisation of electrically operated apparatus and appliances which proved, in practice, cheaper and more efficient, and had become almost essential to successful commercial working nowadays.

Electricity and the Countrywoman

Sir John Snell, chairman of the Electricity Commissioners, received a joint deputation on May 2nd from the Electrical Association for Women and the National Federation of Women's Institutes, to discuss the question of countryside electrification from the woman's point of view. Sir John outlined the present position with regard to rural development, especially in connection with the Bedford and Norwich schemes. The representatives of the Women's Institutes included Miss Miles, chairman of the Federation's Education Sub-committee, Mrs. Wintringham of the Executive Council, and the Hon. Frances Farrer, the general secretary; Lady Moir, the president, Mrs. G. Z. de Ferranti, the chairman, Councillor Mrs. Gregory, vice-chairman, and Miss C. Haslett, the director, attended on behalf of the E.A.W. Sir John Snell was accompanied by Mr. E. W. Dickinson, the Rural Development Officer.

Educational

Particulars of a correspondence course in electrical salesmanship are now available from International Correspondence Schools, Ltd.

(See our advertisement pages to-day.)

Appeal by the Frinton Electric Company

In the Court of Appeal on May 4th, Lord Justices Scrutton, Greer, and Slesser had before them the case of Poole v. The Frinton-on-Sea & District Electric Light & Power Co. (reported in our issue of February 19th, p. 278) which came before the Court upon an appeal by the Frinton-on-Sea & District Electric Co. from the judgment of Mr. Justice Bennett, holding that the Company was liable to pay damages to Mr. T. E. Poole and Mr. W. T. Warren, Brightlingsea, for destruction by fire of some sheds and their contents.

Mr. Poole owned land adjoining the defendant company's works, upon which were some sheds used as stores by Mr. Warren and others. Adjoining the land were the exhaust pipes from two oil engines at the works. Plaintiffs' case was that the oil was sprayed over the land around the sheds and that flames and sparks were emitted from the exhaust, with the result that on February 21st, 1930, there was a fire which destroyed some of the sheds and their contents, causing considerable loss. It was suggested that sparks or fire from the exhaust set light to the oil on the land which caught the sheds.

The defendant company denied responsibility for the fire which, it contended, most probably started inside one of the sheds.

Mr. Justice Bennett came to the conclusion that the plaintiffs had made out their case and gave judgment in their favour.

Mr. Pritt, K.C., for the appellants (the defendant company), said in his view the only question was whether the plaintiffs got out of the region of conjecture and into the region of proof, in their effort to establish that the electricity works plant set fire to the sheds. The appellants' surmise was that the fire started among the very combustible material inside one of the sheds and thought it was unlikely to be due to spontaneous combustion, but it might have been caused by a dropped cigarette end.

The Court, without calling upon counsel for the respondents, dismissed the appeal, holding that in the events that had happened Mr. Justice Bennett had arrived at a right conclusion on the facts before him.

The Midland Ball

The Committee of the Midland Electrical Engineers' Ball has issued a preliminary notice stating that it has unanimously decided again to hold the Ball in the Grosvenor Suite, Grand Hotel, Birmingham, on November 18th next.

Appointments Vacant

Clerk for Dumfries County Council Electricity Department.

Stores and accounts clerk and junior mains engineer for Basingstoke Electricity Department.

(See our advertisement pages to-day.)

Arc Welding

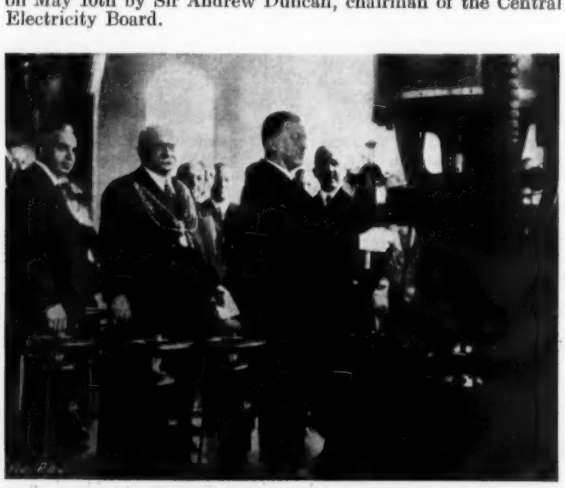
The Metropolitan-Vickers Electrical Co., Ltd., has issued an illustrated descriptive leaflet based on a paper on electric arc welding read before the Manchester Association of Engineers by Mr. L. Miller. Particulars are given relating to the savings resulting from using fabricated steel parts in place of cast iron, the design of welded structures, the training of welders, the development of apparatus, and the technique of welding. Copies are available without charge to engineers interested in the subject.

A Fast Turbo-electric Steamer

The s.s. *Rangatira*, which is propelled by B.T.-H. turbo-electric equipment, is claimed to be the fastest cross-Channel vessel in the world. Recently between Wellington and Picton and back her average speed was 23¼ knots, in spite of a strong gale; the maximum speed was nearly 24 knots, exceeding by nearly two knots the maximum attained on official trials. The vessel was berthed in fifteen minutes.

Extensions at Plymouth

THE additional generating plant at Prince Rock power station of Plymouth Corporation was officially inaugurated on May 10th by Sir Andrew Duncan, chairman of the Central Electricity Board.



Sir Andrew Duncan starting up the new plant at Plymouth

The new 15,000-kW (m.c.r.) "Metrovick" turbo alternator and condensing plant brings the generating capacity of the station up to 34,850 kW. It consists of a single-cylinder impulse 3,000-r.p.m. turbine operating at 200 lb. per sq. in., 588 deg. F. Two external f.w. heaters are fed with bled steam and a separate heater with gland steam. The alternator is designed for 18,750 kVA at 0.8 p.f. (m.c.r.), 6,600 V, 50 cycles. The central flow condensing plant of 17,000 sq. ft. surface is designed to give 28.5 in. Hg at 12,000 kW; all the pumps are driven by 530-580-V d.c. motors.

The M.V. 6,600-V 1,000- and 2,000-A metal clad switchgear for controlling the output of the station and connecting with the grid has a rupturing capacity of 500,000 kVA. The four new 40,000 lb. per hr. (52,000 lb. max.) water-tube boilers (John Thompson & Co., Ltd.) are each equipped with one L-type Underfeed stoker and four motor-driven fans. Each pair of boilers is coupled to a Green's tri-tube economiser.

A centralised control board, supplied by the Electroflo Meter Co., indicates all temperatures, CO_2 readings, and summation readings. The new boilers increase the steaming capacity of the station to 360,000 lb. of steam per hr. (maximum 458,000 lb.).

The 6,600-V feeder Reyrolle switchgear has a rupturing capacity of 250,000 kVA; it is in three sections, coupled by section switches and fed through Crompton Parkinson reactors of the three-phase outdoor oil-immersed type, each capable of passing 876 A with a reactive voltage drop of 6½ per cent. (248 V) per phase.

The kWh generated for the twelve months ended March 31st was 32.3 million (25.1 million sold) and the total kW connected by 36,870 consumers was 40,800.

At a subsequent luncheon Sir Andrew Duncan urged the Council to start a hiring scheme with a view to increasing the consumption in Plymouth, which was very low per head of population. Sir Felix Pole looked forward to the gradual elimination of the coal fire and advocated a definite selling campaign. The chairman (Ald. Modley) paid a tribute to the work of Mr. E. G. Okell (city electrical engineer since 1901) and of his deputy, Mr. R. Illingworth. During an inspection of the grid sub-station, Sir Archibald Page explained the working of the national scheme.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. J. B. Morgan, who has recently been appointed electrical engineer to East Grinstead Urban District Council, served as assistant engineer in the electricity undertakings at Aberdeen, Worcester, and Cheltenham. In 1903 he was appointed resident and consulting electrical engineer to Horsham Urban District Council, and left there in 1916 to take up the position of works manager to Messrs. H. & E. Lintott, Horsham. From 1923 to the early part of the current year he was chief engineer and buyer to the Sussex Brick Co., Ltd. He has acted as consulting engineer to Basingstoke Corporation, preparing plans, &c., for the electricity undertaking, to the East Grinstead Council, for the refuse destructor scheme and for the power station and mains, the Sussex Brick Co., previous to joining the regular staff in 1923, and has carried out consulting work in various parts of the country, including work for the Earl De La Warr, and the Duchess of Norfolk. He has been acting as supervisory engineer for the East Grinstead Council during the past four years and the undertaking requires a resident engineer.

Mr. J. B. Morgan, electrical engineer to East Grinstead U.D.C.

Mr. H. R. Kempe.—It will be recalled that, on the occasion of the golden wedding of Mr. Harry Robert Kempe, M.Inst.C.E., M.I.Mech.E., M.I.E.E., and Mrs. Kempe in July last, a fund was opened to place memorial choir stalls in Christ Church, Brockham. We learn that gifts in appreciation of Mr. Kempe's "life-long service for others" were received from friends throughout the world and on Sunday last, May 8th, the stalls were dedicated by the Bishop of Kingston. Mr. Kempe, who retired in 1912 from the position of principal staff engineer and electrician to the General Post Office, resides at "Lavethan," Brockham, Betchworth, Surrey.

Lord Rutherford has been re-elected Professor of Natural Philosophy by the Royal Institution.

Mr. E. Camm, of the Weymouth Corporation electricity works staff, who was married on April 30th, has been presented by his colleagues with a dinner service.

Lord Eustace Percy was elected president for the ensuing year at the annual meeting of the Royal Institution held on May 2nd.

Mr. C. Le Maistre, director of the British Standards Institution, was in Ottawa last week, where he had conferences with the Prime Minister, and other Ministers and departmental officials, regarding the establishment of a common system of Imperial standards. He has also conferred with industrial and business leaders in Toronto, Montreal, and elsewhere.

Mr. R. A. Erskine, of Messrs. Erskine, Heap & Co., Ltd., has just returned from a four months' tour in South Africa and Rhodesia, visiting the various branches of the company's representatives there, Messrs. Hubert Davies & Co., Ltd., as well as important municipalities and industrial concerns.

Mr. R. A. Wyatt, manager of the Melbourne branch of the British General Electric Co., Ltd., Australia, has been elected president of the Victorian Electrical Federation for the ensuing year.

Mr. R. S. J. Spilsbury, of the National Physical Laboratory, Teddington, has been nominated for the chairmanship of the Meter and Instrument Section of the Institution of Electrical Engineers to fill the vacancy which will occur on September 30th next on the retirement of Mr. F. C. Knowles.

Mr. C. F. Wolsey, tramway traffic superintendent at Stockport, who is leaving to become tramway manager to the Douglas Corporation, has been presented by the heads of departments, tramway inspectors, and the staff with a Westminster chiming clock and a silver pencil. The presentation was made on May 3rd by the manager, Mr. A. T. Eardley.

Mr. G. P. Dixon, an assistant to Mr. W. C. C. Hawtayne, has been appointed assistant borough electrical engineer to the Colchester Corporation at a salary of £500 per annum, rising by £25 annually to £600. The Electricity Committee reports that the appointment is desirable owing to the growth of the undertaking and the extent of its operations.

Dr. T. A. McLaughlin, the director of the Shannon scheme, was presented with a silver model of the Ardnacrusha power station on May 6th at the Gresham Hotel, Dublin. Mr. J. O'Farrell, on behalf of the Electricity Supply Board Committee, said that Dr. McLaughlin had raised electrical development in the Irish Free State on to a new plane, and directed the application of electricity in the national interest. In reply, Dr. McLaughlin said that they had all worked for the success of the first great attempt at the exploitation of the native resources of the country and their utilisation to improve the economic standards of livelihood of the people.

Dr. J. S. van der Lingen has been appointed chairman of the South African Electricity Control Board, in succession to Dr. Hans Pirow. The Board, which was created in 1922, controls the supply of electricity by the Electricity Supply Commission and private undertakings.

The following appointments have been made by Belfast Corporation in connection with the scheme for the reorganisation of the Electricity Department.—**Mr. W. J. Girvan,** technical assistant, appointed chief technical assistant and consumers' engineer, at a salary of £712; **Mr. W. A. Frazer,** mains engineer, appointed mains superintendent at a basic salary of £611 per annum; **Mr. J. M'Clay,** chief draughtsman, appointed constructional engineer at a basic salary of £611; and **Mr. J. H. W. Downey,** sales assistant, appointed commercial assistant and showroom manager at £500 per annum.

The Duke of Atholl, chairman of the Anglo-Argentine Tramways Co., has sailed for the Argentine on an important mission affecting the Anglo-Argentine Tramways. Before leaving he stated that for various reasons £16,000,000 was in jeopardy and he wanted to do all he could to adjust the difficulties which had arisen between the municipality of Buenos Aires and the company. Goodwill and understanding on both sides would solve the difficulty.

Mr. A. Baker, head foreman electrician of the Palmer's Shipbuilding and Iron Co., Jarrow and Hebburn, has retired after being with the company 30 years. In 1889 he went to Spain to carry out the electrical work on three cruisers being built for the Spanish Government at the Astillros del Nervion Works at Bilbao. In 1895 he took an appointment with Messrs. Clarke, Chapman & Co., on the Clyde, where he remained until 1908, when he accepted the appointment he has now vacated. Mr. Baker has been presented with a silver tea service from the foremen and staff of the works.

Mr. N. O. Curry, M.I.Mech.E., M.(S.A.)I.E.E., representative in South Africa of Messrs. C. A. Parsons & Co., Ltd., Messrs. A. Reyrolle & Co., Ltd., and Messrs. J. H. Holmes and Co., Ltd., left Capetown on May 3rd for England, to make one of his periodical visits to the works. Later he will leave Southampton with the members of the Institution of Mechanical Engineers for the Canadian summer meeting, returning to South Africa at the end of September.

Mr. J. C. Denison Pender, governor and managing director of Cables & Wireless, Ltd., who is at present acting as chairman of Imperial and International Communications, Ltd., celebrated his 50th birthday yesterday (Thursday), when a volume was presented to him containing over 10,000 signatures of the staff, all of whom have voluntarily agreed to a reduction in pay and an increase in hours of duty between April and December.

Obituary

Mr. J. A. Henderson.—We regret to record the death of Mr. J. A. Henderson, of Messrs. Merz & McLellan, which occurred on May 3rd, at the age of 42 years, at his home at Grove Park. He was well known throughout the industry, having been engaged in the London area since 1923 on the laying of the first 33-kV and 66-kV mains into the city, together with the sub-station constructional work associated therewith. Prior to this, Mr. Henderson was engaged by the British Insulated Cables, Ltd., on similar work in the North-East Coast area. The funeral took place at Hither Green Cemetery on Saturday last.

Herr F. A. Haselwander.—The death recently occurred in Offenburg, Germany, at the age of seventy-two years, of Herr Friedr. A. Haselwander, who is described in the German technical Press as the constructor of the first a.c. generator which he built in 1887, and which is now included among the exhibits in the German Museum at Munich.

Mr. W. A. Sheaves.—We regret to record that Mr. W. A. Sheaves, who had been London branch manager for Messrs. Cryselco, Ltd., since 1924, died in a London nursing home on April 30th. The funeral took place at Golders Green Crematorium on May 5th. Mr. Sheaves leaves a widow and daughter.

Brig.-Gen. E. Baring.—The death is announced, at his home in London, of Brig.-Gen. the Hon. Everard Baring, at the age of 66. He was chairman of the Southern Railway Co., and a director of a number of other companies, including the London Electric Supply Corporation, Ltd.

Dr. A. Elfes.—The death is reported of Dr. August Elfes, deputy chairman of the board of control of the Allgemeine Elektizitäts Gesellschaft.

Will.—Mr. P. T. Foley, of Nice, a former director of the Eastern Telegraph Co., left £5,491.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

English Insulating Machines, Ltd.—Private company. Registered May 5th. Capital, £1,560 in £1 shares. Objects: To acquire interests in any invention relating to machinery for the manufacture or treatment of insulated cables or for the production, treatment, storage, application, distribution and use of electricity, and, in particular, to acquire from Pourtier Frères, of 113, Rue du Général Gallieni Romainville (Seine), France, and/or Gaston Pourtier and/or Georges Pourtier, both of Romainville (Seine), France, any rights in any patents relating thereto. The first directors are: A. L. Wykes, Cliffe House, Barrow-on-Soar; G. Pourtier, 35, Rue Folie-Mericourt, Paris; and W. Harling, "Meadowcroft," Squires Gate, Blackpool. Registered office: Rose Grove Iron Works, Burnley, Lancs.

Barium Metal Works, Ltd.—Private company. Registered April 29th. Capital, £1,000 in £1 shares. Objects: To acquire all machinery, plant, &c., in the business carried on by Miss C. Stevens at Lancaster Road, Southall, Middlesex, as "Barium Metal Works," and to carry on the business of manufacturers of and dealers in radio receiving and transmitting valves, &c. The permanent directors are: J. S. Lowden, 70, South Audley Street, W.1, and Catherine Stevens, Bungalow, Lancaster Road, Southall. Registered office: Lancaster Road, Southall, Middlesex.

Barnett & Soans, Ltd.—Private company. Registered May 4th. Capital, £30,000 in £1 shares. Objects: To acquire the business of electrical engineers and contractors, etc., carried on by J. G. Barnett, R. C. Soans, and A. Gould at Burton-on-Trent and elsewhere as "Barnett & Soans." The directors are: J. G. Barnett (chairman), The Nook, 43, Main Street, Stapenhill, Burton-on-Trent, and A. Gould, 52, James Street, Stoke-on-Trent. Registered office: 118a, High Street, Burton-on-Trent.

Low Tension Luminous Tubes, Ltd.—Private company. Registered May 5th. Capital, £10,000 in £1 shares (6,000 8 per cent. cumulative participating preference and 4,000 ordinary). Objects: To acquire from A. E. Chapman the benefit of certain existing inventions relating to gas-filled electric discharge tubes and incandescent filament lamps. The first directors are: Viscount Selby, address not stated; A. E. Chapman, 125, Stanley Park Road, Carshalton; F. J. Palmer, 18-20, Lower Regent Street, S.W.1; and V. C. Hardy, address not stated. Solicitors: Lawrance Messer & Co., 16, Coleman Street, E.C.2.

D. & B. Electrical Co., Limited.—Private company. Registered May 6th. Capital, £600 in 1s. shares. Objects: To acquire the business of electrical engineers and manufacturers of electrical equipment, carried on by J. A. Downing and T. Blake at Cork, Irish Free State. The directors are: J. J. O'Hea, Swiftsden, Hurst Green, Sussex; Dr. T. Bake, 22, St. Patrick's Hill, Cork; and J. A. Downing, 9, South Terrace, Cork. Registered office: 14, Buckingham Street, Strand, W.C.2.

Brodie & Hall, Ltd.—Private company. Registered in Edinburgh, May 5th. Capital, £5,000 in £1 shares. Objects: To acquire the business of Brodie & Hall, electrical engineers, now carried on at 2, Dock Breast, Greenock, and elsewhere. The directors are: J. Brodie and D. H. Hall, both of 2, Dock Breast, Greenock. Solicitors: John Adam & Son, Paisley.

Returns of Electrical Companies

Santon, Ltd.—Charge on 70, Dock Street, and 1, Powells Place, Newport, Mon, dated April 16th, to secure all moneys due or to become due from the company to Lloyds Bank Ltd., not exceeding £500.

Wego Condenser Co., Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated April 25th, to secure all moneys due or to become due from the company to Barclays Bank Ltd.

Caplin Engineering Co., Ltd.—Particulars filed of £2,200 debentures authorised March 8th, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Armaflex Parent, Ltd.—C. Latham, of 78, New Oxford Street, W.C.1, ceased to act as receiver and manager on April 20th.

Hexham & District Electric Supply Co., Ltd.—Satisfaction to the extent of £7,500 on April 15th, of a series of second debentures authorised by resolution dated August 27th, 1928, and registered September 4th, 1928, securing £10,000, of which £2,500 has been cancelled.

Radio Vacuum Cleaners, Ltd.—Satisfaction in full on February 26th of mortgage dated September 22nd, 1930, and registered October 6th, 1930. (According to the register of mortgages, the mortgage registered October 6th, 1930, originally secured all moneys due to bank.)

Sloan Electrical Co., Ltd.—Issue on May 2nd of £10,000 debentures, part of a series already registered.

Wellington District Electricity Co., Ltd.—Capital, £30,000 in £1 shares. Return dated October 12th, 1931. 20,000 shares taken up. £20,000 paid. Mortgages and charges, nil. A return of allotments made up to December 18th, 1931, shows a further 7,500 shares allotted, payable in cash and fully called up.

Ernest Jones (Bradford), Ltd.—Capital, £3,000 in £1 shares. Return dated January 12th, 1932. 1,173 shares taken up. £1,173 paid. Mortgages and charges, nil.

Berkeley & Young, Ltd.—Capital, £22,000 in £1 shares (subdivision not stated). Return dated January 16th, 1932. 6,276 preference and 11,520 ordinary shares taken up. £7,786 paid on 1,510 ordinary and 6,276 preference shares. £10,010 considered as paid on 10,010 ordinary shares. Mortgages and charges, nil.

Nefa Co., Ltd.—Capital, £1,000 in £1 shares. Return dated January 14th, 1932. 999 shares taken up. £999 paid. Mortgages and charges: £500.

Veritys, Ltd.—Capital, £196,000 in 7,000 5 per cent. preference and 7,000 6 per cent. preference shares of £10, 7,000 preferred ordinary shares of £7 10s., and 70,000 deferred ordinary shares of 1s. each. Return dated January 14th, 1932. All shares taken up. £137,701 10s. paid on 4,670 5 per cent. preference, 7,000 6 per cent. preference, 2,300 preferred ordinary, and 30 deferred ordinary shares. £58,298 10s. considered as paid on 2,330 5 per cent. preference, 4,200 preferred ordinary, and 69,970 deferred ordinary shares. Mortgages and charges: £122,454.

Prangnell Partners, Ltd.—Capital, £1,000 in £1 shares. Return dated January 11th, 1932. 962 shares taken up. £174 10s. paid (5s. per share on 650 and £1 per share on 12 shares). £300 considered as paid on 300 shares. Mortgages and charges, nil.

City Notes

Johnson & Phillips, Ltd.—The accounts of this company were abstracted in our issue of April 29th, p. 653, and the annual meeting was held on May 5th, Mr. G. Leslie Wates (chairman) presiding. In the course of his speech the chairman said, in reviewing the balance sheet, that the investments in subsidiary companies were substantially the same, although there had been a readjustment among the several companies. Sundry debtors and cash, taken together, were about £30,000 more than last year and creditors were about £35,000 less. The cash was substantially all in Australia, and it was decided to leave the money on deposit in the Bank of Australia, rather than bring it to London and shoulder the loss necessitated thereby. If any loss should ultimately be suffered in respect of their assets in Australia by reason of the depreciation of exchange, they would feel at liberty to use reserves to make good such loss, rather than deplete the profits of the year. With regard to the profit and loss account the position was one of considerable disappointment. Business showed a falling off during the latter months of 1930, and although in the spring of 1931 more orders were obtained, the improvement did not continue, and the general depression which persisted was made worse by the wave of economy and stringent cutting down of expenditure by Government departments, local authorities, and other large public bodies, which succeeded the national crisis and the formation of the National Government. During 1930 there had been a greater falling-off in orders from private customers, as compared with the decline in Government and similar orders, but in 1931 the latter also severely cut down their expenditure. He felt that a little less emphasis on *not* spending, and a little more emphasis on *wise* spending would be to the advantage of the world in general, and to themselves in particular. As so much of their work was for Government departments and local authorities, they had suffered more perhaps than others from prevailing conditions, and the position did not yet show signs of improvement. The depression was world wide, affecting foreign as well as home trade. It had resulted in the keenest competition, and the cutting of profits to a minimum. Economies in production and administration were being made and in spite of a serious drop in turnover the percentage of gross profit to turnover during the past year had actually increased. The reduction of business available had resulted in much keener competition and their Estimating Departments had been far busier, relatively, than other departments. They were taking all possible steps to weather the storm without injury to their assets and sound financial position, and they were investigating and taking up certain new lines of manufacture with the object of broadening the basis of their business.

Sir Philip Dawson, in seconding the resolution for the adoption of the report and accounts, confirmed the chairman's remarks on the false economy which was being exercised in many quarters, and particularly by public utilities which were not spending money on extensions which would be revenue earning. Spending money on revenue-earning work would eventually mean economy, and there would be less unemployment, and the industries of this country would be in a better position to compete in the world's markets. The electrical industry had been, and was being, increasingly affected by the fact that our heavy industries had been in such a bad position, but he believed that the legislation which had been introduced would improve the conditions under which those industries had been working, and thus enable them to modernise and place more work in the hands of electrical undertakings. He was convinced that, as a result of the Ottawa Conference, by laying a sound foundation for Imperial economic unity, we should in time begin to see a recovery of prosperity in this country.

The British Power & Light Corporation (1929), Ltd.—The accounts of this company were abstracted in our last issue, p. 688, and the annual meeting was held on May 6th. Mr. H. A. Vernet (chairman), who presided, said that the North Wales Power Co. showed an increase in general sales of electricity of 4.1 per cent., following an increase of 9.5 per cent. in the preceding year. The supplies to authorised undertakers again showed a satisfactory increase, and the sales to quarries showed a substantially more satisfactory increase for 1931 than for 1930. These figures were, however, considerably offset by an appreciable decrease in the sales to miscellaneous consumers. Of this, the greater part was accounted for by a decline in the sales to the L.M. & S. Railway Co. for the shops at Crewe; other large consumers also felt the effect of the industrial depression. The North Wales Power Co. showed a substantially improved increase in sales for the first quarter of the current year. Authorised undertakers continued to show considerable enterprise in developing the general domestic and other load in their districts, so that the rate of increase in sales to them continued to be satisfactory. The decline in road-making activities was affecting the granite quarrying industry, but the slate quarrying industry was experiencing better trade. The sales to L.M. & S. Railway Co. for the first

quarter of this year also showed a satisfactory increase, partly attributable to the fact that they had slightly modified their contract for the supply of energy, while supplies to miscellaneous consumers showed a good increase. The Electricity Distribution of North Wales & District reported an increase in consumers of more than 23 per cent. at 12,363, while the increased consumption of electricity was almost 35 per cent. The progress of the English distribution companies had given them a higher percentage increase in consumers connected and electricity sold than even the Distribution of North Wales. This was largely due to the fact that those companies had only recently commenced operations, and though progress had been less rapid than they had hoped in the conditions obtaining in 1929, it had been continuous. The report and accounts were adopted, and a resolution was carried authorising an increase in the capital to £2,800,000 by the creation of 800,000 preference shares of £1 each.

A prospectus offering 600,000 6 per cent. cum. preference shares of £1 each at par was published on Tuesday morning and the list was to be closed "on or before May 13th." It was explained at the meeting that this was part of the 800,000 shares to be created, and that the issue would place the company in funds for the programme of expansion to which the company was already committed and for further extensions reasonably to be expected in the near future, leaving also an unissued balance of £200,000 which should be sufficient for capital requirements for some time to come. At the date of the balance sheet the bank loan stood at £347,000, and the chairman of the meeting stated that it had since been increased to £416,000. It was indicated last year that the board regarded short-term borrowing as a temporary expedient, to be replaced by permanent capital as soon as circumstances permitted. This issue is now made as the time has come for putting the company's finances on a permanent footing. The bank loans referred to are for capital advanced by the Corporation to its subsidiary companies and expended on developments and extensions. The balance of the £600,000 will be used for further similar advances and for general purposes.

The Telephone Manufacturing Co. (1929), Ltd., held its annual meeting on May 9th. Mr. F. T. Jackson (chairman), who presided, in the course of his speech said the increased profit of £22,085 was satisfactory, but they did not recommend the payment of a dividend. The advent of a certain measure of protection would be of distinct advantage to them, for although the British Post Office specified that manufactured goods should be of British origin, and raw material of Imperial origin, their manufacturing facilities extended to the supply of private telephone apparatus, private automatic exchanges, &c., to the various installation companies subsidiary to Telephone Rentals, Ltd., and in this market they, and the Telephone Mfg. Co. had met with considerable competition from apparatus of Continental origin. The value of contracts in hand on January 1st last was substantially greater than on January 1st, 1931. The propaganda of the Telephone Development Association and the improved selling methods of the Post Office had prevented the demand for telephone apparatus slacking to the extent which might have been expected in the circumstances. Electrical impulse clocks and a.c. clocks had been added to their manufacturing programme.

The Calcutta Electric Supply Corporation, Ltd., held its annual meeting on May 9th, when Lord Meston (chairman), who presided, said the reconditioning of the Cossipore station had continued during the year under review and a 20,000-kW turbo-alternator was put into commission at the Southern station. The bore of the tunnel beneath the Hoogly between the Southern station and right bank was completed in August and they were now on the eve of putting cables through it to provide an efficient supply in the southern area of Howrah. The sales of electricity had yielded nearly £5,000 less than for the preceding year. The industrial load showed an improvement of over 5,000,000 kWh, but the domestic load increased by barely 500,000 kWh, and as the flat rate of charge had been reduced in June there was a substantial drop in receipts from that quarter. With better times the cheaper supply of electricity would bring its reward of higher consumption. The balance sheet indicated a sound financial position. With a decline of over £41,000 in net profits and with over 300,000 new ordinary shares they proposed a bonus of 3d. per ordinary share in lieu of last year's 5d., in addition to the 12 per cent. which they now aimed at as the standard dividend in years of ordinary prosperity.

The Urban Electric Supply Co., Ltd., reports a net profit, after providing for interest and income tax, of £105,694, as compared with £102,769, to which is added £19,559 brought in, making £125,254. From this the following appropriations are recommended: Depreciation reserve, £30,000; general reserve, £5,000; staff benevolent fund, £2,000. It is proposed to pay a final ordinary dividend of 4 per cent., making 7 per cent. for the year (as for 1930), and to carry forward £18,253. During the year the outstanding balances of the 4½ per cent. first mortgage debenture stock and the 5½ per cent. mortgage debenture stock were redeemed. The Molesey, Long Ditton, Esher, and Ham undertakings of the Twickenham subsidiary company and the Weybridge undertaking were transferred to the London and Home Counties J.E.A. at the commencement of the year. Control of the Callington & District Electric Supply Co., Ltd., has been acquired. Meeting: May 19th.

The Craigpark Electric Cable Co., Ltd., reports a profit for the year ended March 31st last of £16,738, as compared with £14,492 in the preceding year. To this is added £2,018 brought in, and, after charging £6,292 for depreciation of land, buildings, &c., there is a balance of £12,463 available. It is proposed to pay a final dividend of 6 per cent., actual, on the ordinary shares, making 10 per cent. for the year (same), and to carry forward £4,363 (subject to payment of directors' fees). The report states that, despite trade depression, the factory has been well employed.

The Ever-Ready Co. (Great Britain), Ltd., reports a profit for the year ended March 31st last of £332,485, as compared with £306,111 for the preceding year. A final dividend of 25 per cent. is proposed on the ordinary shares, making 35 per cent. for the year and £44,119 is carried forward. The report states that to meet the growth of the business a sum of £115,000 was spent during the year on buildings, plant and equipment. It is proposed to issue 434,240 ordinary shares of 5s. each at 10s. per share, and ordinary shareholders will be allotted one share for every five held. Meeting: May 31st.

The General Electric Co. of New York.—At the annual meeting held in Schenectady on April 19th Mr. G. Swope (president) stated that orders received for the first quarter of 1932 amounted to $33,404,642, as compared with $60,366,297 for the corresponding three months of last year, while sales billed amounted to $37,876,399, as compared with $61,959,801. The profit available for dividends on common stock for the first quarter of 1932 was $4,508,667.85, as compared with $10,844,334, which is equivalent to 16 cents per share in 1932 and 38 cents in 1931. The quarterly dividend on the common stock, payable on April 25th, is 25 cents per share, compared with 40 cents per share paid a year ago.

The Calcutta Tramways Co., Ltd., held its annual meeting on May 4th, when Mr. J. G. B. Stone (chairman), who presided, said that during 1931 the omnibus competition was as intense as during the preceding year, but during the closing months of the period under review the tramcars were able to attract a larger proportion of the traffic offering, due to the running of a quicker and more regular service, coupled with the putting into operation in October last of the first instalment of the new rolling stock. The number of passengers carried increased by 10½ millions. He was confident that with the return of normal conditions the tramways would maintain their position as being the cheapest and most reliable form of transport for the city.

The London Electric Wire Co. & Smiths, Ltd., reports a balance, after meeting all expenses, &c., of £63,250, as compared with £60,171 in the preceding year. The preference dividend absorbs £30,000, and it is proposed to pay a final ordinary dividend of 3½ per cent., making 5 per cent., less tax, for the year, leaving £22,774 to be carried forward. The report states that the business of the company has been restricted by the world-wide depression, and rendered difficult by the fluctuations in the price of raw materials.

The Cawnpore Electric Supply Corporation, Ltd., reports a net revenue for 1931 of £79,297, as compared with £81,419 in the preceding year. To this is added £6,119 brought in, making £85,416. After transferring £30,000 to depreciation and renewals, £5,000 to income-tax account, and £8,616 to debenture sinking fund, it is proposed to pay a final ordinary dividend of 7 per cent., making 10 per cent. for the year. The electrical energy sold increased from 35,966,906 to 38,332,048 kWh.

The Telegraph Construction & Maintenance Co., Ltd., held an extraordinary general meeting on May 6th, when a resolution was passed for the concentration of all manufacture at Greenwich and a reduction of capital by £7 per share (to be returned to shareholders), and the conversion of the remainder of the capital into stock, transferable in sums of £1 or multiples thereof. Meetings of shareholders to sanction the alterations in the capital will be convened in due course.

The Oriental Telephone and Electric Co., Ltd., reports a net revenue for 1931 of £96,110, against £100,001 in the preceding year. The final ordinary dividend is 8 per cent., making 12 per cent., tax free, for the year, and to mark the jubilee of the company a special bonus of 2 per cent., tax free, is being paid on the ordinary shares. General reserve receives £5,000 and £41,236 (£43,169) is carried forward. Meeting: May 20th.

The British Electric Traction Co., Ltd., proposes to pay a bonus of 100 per cent., in £1 deferred ordinary shares, to the deferred stockholders out of the balance standing to the credit of undivided profits account. The net profit for the year ended March 31st last was £254,314, and after payment of dividends, including 5 per cent. on the deferred ordinary stock, £81,049 is added to the undivided profits account.

Callender's Cable & Construction Co., Ltd., has recommended the payment of a dividend at the rate of 15 per cent. per annum, less tax (of which 5 per cent. less tax was paid in November last). The annual general meeting will be held on June 2nd.

The Chloride Electrical Storage Co., Ltd., announces a final dividend of 5 per cent. on the "A" and "B" ordinary shares, making 10 per cent., tax free, for the year (against 15 per cent.).

Edison Swan Cables, Ltd., has announced its intention to redeem the whole of the outstanding 5½ per cent. guaranteed first mortgage debentures on November 4th next at £50 10s. per £50 debenture.

Brook Motors, Ltd.—The directors recently declared an interim dividend of 10 per cent. on the ordinary shares.

The Para Telephone Co. reports a net profit of £3,460 for 1931. A dividend of 3 per cent. is paid and £1,152 is carried forward.

Stocks and Shares

TUESDAY EVENING.

ANTICIPATION in the Stock Exchange, and in the City generally, looks for a further reduction in Bank Rate to 2½ per cent. as likely to be made during the present month. The amount of money now available for investment is so considerable that borrowers, and those who have good shares to offer, experience embarrassment in making allotments of the oversubscription which is the common result of advertising the issues. The 600,000 Scottish Power new preference shares, offered last week at 21s., were oversubscribed nearly twelve times, in spite of the comparatively high price at which the issue was made. Dealings were expected to start on the basis of 6d. premium. The Central Electricity Board 5 per cent. scrip, which came out at 95, has risen to 9 premium. The 4½ per cent. stock of 1951-1973 stands at 97, and the 4 per cent. 1959-1989 at 85. London and Home Counties debenture scrip is in demand at 2½ premium. Stocks of the electricity authorities are popular with a good many people who are selling their 5 per cent. War Loan lest they should be offered cash, or a security bearing a lower rate of interest.

Home Electricity Supply Shares

County of London ordinary have recovered 9d., and stand at £2 2s. The newly issued shares, allotted by way of bonus at 38s. 6d., command a premium of 2s. as against the opening price of a little under a shilling premium. Electrical Distribution of Yorkshire new preference, which came out at a guinea per share, have strengthened to 24s. 3d. Clyde Valley are easier at 27s. 6d. The rest of the London and Provincial electricity supply shares in the market are holding their prices. Of the debenture stocks, Bournemouth and Poole have risen to 94, Charing Cross 4½ per cents. to 96½. Electric Supply preference are better at 23s. 6d.

The Overseas Group

In the Overseas list, Victoria Falls and Transvaal Power are 1/16 lower at 56s. 3d. The Madras Electric Supply Corporation succeeded in making net profits last year of £66,700, about £2,400 less than in 1930. The ordinary share dividend is again to be 8 per cent., tax free. It is proposed to issue to the shareholders new preference and ordinary shares, both of £1 each, in order to raise fresh capital for defraying the cost of new plant, in redeeming the company's 7 per cent. second debentures, and for its general business. The price of the ordinary shares is 28s. 9d., and the 5½ per cent. preference, on which the dividend is also paid free of income tax, stand at 22s. 6d. Madras Electric Trams 5½ per cent. debenture is 7 up at 82½. The British Power and Light Corporation (1929), Ltd., has made this week an issue of 600,000 6 per cent. cumulative preference shares of £1 each which were offered at par. The ordinary are quoted at 13s. 3d.

Home Railway Stocks

Once more Metropolitan Railway consolidated stock provides a feature in this section. The price has risen 5 to 44½, and is now about eleven points higher than it stood a month ago. The recently issued 5 per cent. debenture stock is 2 points better on the week at 6¼ premium, and District 5 per cent. debenture at 7 premium has recovered its last week's decline caused by some of the holders selling their stock in order to exchange into the Metropolitan debenture. Underground Electric ordinary shares have fallen 6d. to 17s., apparently on some fear lest the last year's dividend of 7 per cent. may not be maintained.

Cables and Wireless

Better prices are quoted for Cables and Wireless preference and "A" stocks, the recovery being due more to bear buying than to any particular demand on the part of the speculative investor. Globe Telegraphs remain weak, the 6½ per cent. preference failing to recover from last week's fall to 6½. Anglo-American preferred is a point lower at 97½, and Marconi Marines remain dull at 23s. 9d. Oriental Telephones are unaltered at 2¾. The report shows earnings of £96,000 last year, being £4,000 down as compared with 1930. A final dividend, making 10 per cent., free of tax, for the year, is declared, together with a special jubilee bonus of 2 per cent., tax free. The dividend and bonus are the same as those paid in the previous year, and the shares at the current price of 47s. 6d. give a return of a little over 5 per cent. net on the money. American Telephone and Telegraphs have receded 5, to 135; Internationals are practically unaltered at 8½.

British Electric Traction

British Electric Traction deferred ordinary stock continues its downward path, and at 675 repeats the 25 points fall of a week ago. In the statement for the year to March 31st last, the directors recommend a bonus of 100 per cent. in £1 deferred ordinary shares to the deferred shareholders. It may be recalled that last year a tentative scheme was put forward for giving the deferred stock a bonus of 500 per cent. in the shape of debentures. Owing to general conditions, this plan was held over for the time being. Disappointment at the failure of the plan to fructify is responsible for the recent decline that has taken place in the price of the deferred stock. The net profit of £254,000 is £17,000 down on the year. Such results cannot be deemed unsatisfactory having regard to the state of affairs prevailing during 1931, and no doubt the directors will pursue their policy of distributing deferred stock by way of bonus as and when opportunity offers in the future.

Equipment and Manufacturing

Callender's Cable created a good impression in the market by maintaining its dividend at the rate of 15 per cent. per annum, but the price of the shares has fallen 1/16 to 51s. 3d. The market in the shares of the manufacturing companies is dull as a whole. Further declines have taken place in British Aluminium, Enfields, Henleys, and Crompton Parkinsons. Siemens are down to 20s. Johnson & Phillips remain at 18s. 9d. Ever-Ready shares are quoted at 22s. 6d. ex the rights to the new issue. The price is still cum dividend. The new shares are being dealt in freely around 11s. premium. British Thomson-Houston preference are better at 24s. 3d.

The engineering market continues to be very dull. Babcock and Wilcox have fallen back to 38s. 9d., and Vickers to 6s. 3d. The market for such shares is in an unbefriended condition, even more, in fact, at the moment than is that for rubber shares.

Tokyo Electric 6 per cent. bonds have risen 2 to 60. Brazilians are better upon a rally in the value of the milreis. The Mexican issues remain in the doldrums. Atlas preference at 19s. show a slight improvement. Telephone Manufacturing at 2s. 9d. are three-halfpence harder.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1930.	1931.	Price. May 10.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	60/9	—	4 18 9
Brompton Ordinary	1	8½	8½	28/–	—	5 0 0
Central Electricity 4½% Deb.	Stock	4½	4½	95½	—	4 14 3
Charing Cross Ordinary	1	8½	8½	29/–	—	4 16 7
Chelsea	1	8¼	8¼	26/6	—	5 5 8
City of London	1	10	10	37/6	—	5 6 8
Clyde Valley	1	8	7	27/6	–9d.	5 1 10
County of London	1	11	10½	42/–	+9d.	5 0 0
Edmundsons' 7% Pref.	1	7	7	26/–	—	5 7 8
Elec. Dis. Yorkshire	1	9	9	35/–	—	5 2 10
Elec. Supply Corporation	1	11	—	47/6	—	4 12 7
Kensington Ordinary	1	8	8	28/6	—	4 18 3
Lancs. Light and Power	1	6½	7	26/3	—	5 6 8
London & Home Counties 4½% Deb.	Stock	4½	4½	96½	—	4 13 3
London Electric	1	9	9	28/–	—	5 0 0
Metropolitan	1	10	10	41/3	—	4 17 0
Midland Counties	1	7	7	28/3	—	4 19 1
Mid. Elec. Power	1	8	8	30/6	—	5 5 0
Newcastle-on-Tyne Ordinary	1	6	6	23/3	—	5 2 3
Do. 7% Pref.	1	7	7	27/6	—	5 1 10
Northampton	1	10	10	40/9	—	4 18 2
Notting Hill 6% Pref.	10	6	6	11	—	5 9 1
North Met. Elec. 6% Pref.	1	6	6	24/6xd.	—	4 18 0
St. James' and Pall Mall	1	8	8	28/–	—	5 0 0
Scottish Power	1	8	—	28/3	—	5 13 3
South London	1	8½	8½	28/–	—	5 0 0
Urban Ordinary	1	7	—	28/–	—	5 0 0
Westminster Ordinary	1	8½	8½	28/–	—	5 0 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	14/6	–6d.	10 6 10
Yorkshire Elec.	1	8	8	33/9	—	4 14 10
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	72½	—	5 10 4
Metropolitan	„	4	3½	44½	+5	7 17 3
Do. District	„	5	4½	51½	—	8 14 10
Underground Electric	1	8	7	17/–	–6d.	8 4 3
TELEGRAPHS AND TELEPHONES.		1929.	1930.			
American Tel. & Tel.	$100	9	9	135	–5	6 13 4
Anglo-Am. Tel. Pref.	Stock	6	6	97½	–1	6 3 1
Do. Def.	„	1½	1½	23	–½	6 10 5
Cables & Wireless 5½% Pref.	„	5½	5½	40½	+1	—
Do. A 7½% Ord.	„	Nil	—	13	+½	—
Do. B Ord.	„	Nil	—	8	—	—
Globe Tel. and T. Ord.	10	10	8½	4½	—	—
Do. do. Pref.	10	6	6	6½	—	9 4 8
Great Northern Tel.	10	20	20	22½	—	8 17 10
Marconi-Marine	1	15	15	24/6	+9d.	8 3 4
Oriental Telephone Ord.	1	12	12	2¾	—	*5 1 1
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	5½	—	6/3	—	—
Do. do. 2nd Pref.	5	6	—	3/9	—	—
Do. do. 5% Deb.	Stock	5	5	9	—	—
British Electric Traction Def. Ord.	„	5	5	675	–25	—
Do. do. Pref. Ord.	„	8	8	119½	—	6 14 0
Brazil Traction	100	8	—	12	+¼	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	89½	—	5 11 9
London & Sub. Trac. 5% Pref.	1	Nil	Nil	3/9	—	—
London United Tram Deb.	Stock	4	4	57½	—	6 19 2
Mexico Trams, 5% Bonds	—	5	5	32½	—	15 7 8
Mexico Light Common	100	Nil	Nil	15½	—	—
Do. 7% Pref.	100	7	7	25½	—	27 9 0
Do. 1st Bonds	—	5	5	62½	—	8 0 0
Victoria Falls Ord.	1	15	15	56/3	–¼	5 6 9
Yorkshire (West Riding)	1	Nil	Nil	5/3	—	—
MANUFACTURING COMPANIES.						
Assoc. Elec. Ord.	1	6	6	17/6xd.	—	4 0 0
Do. Pref.	1	8	8	28/3	—	5 13 3
Babcock & Wilcox	1	15	14	38/9	–¼	7 4 0
British Aluminium Ord.	1	10	10	22/6	–9d.	4 9 0
British Insulated Ord.	1	15	15	53/9	–¼	5 11 7
Brush Ord.	Stock	10	5	55	—	9 1 8
Callender's	1	15	15	51/3	–¼	5 19 3
Do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Ord.	5/–	30	30	17/6	–¼	8 11 6
Do. 8% Pref.	1	8	8	27/6	—	5 16 5
Edison-Swan 1st Pref.	1	7½	7½	23/3	—	6 9 0
Do. 5% Deb.	Stock	5	5	89½	—	5 11 10
Electric Construction	1	5	Nil	7/6	—	—
Enfield Cable Ord.	1	25	25	3¾	–¼	7 8 2
English Electric	1	Nil	Nil	8/9	—	—
Do. do. Pref.	1	Nil	Nil	10/–	—	—
Ever Ready	5/–	35	35	22/6xd.	—	7 15 7
Ferranti Pref.	1	7	7	22/–	—	6 7 3
G.E.C. Pref.	1	6½	6½	26/–	—	5 0 0
Do. Ord.	1	14	10	35/–	—	5 14 3
Henley's	1	30	30	4¾	–¼	6 3 0
Do. 4½ Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	4/6	—	—
Johnson & Phillips	1	10	10	ⅱ	—	10 13 4
Siemens Ord.	1	7½	7½	20/–	–9d.	7 10 0
Telegraph Construction	12	10	7½	10	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1930

29,555. "System of radio telephony and telegraphy." International Radiophone Corporation. October, 31st, 1929 (370,888.)
32,649. "Apparatus for the control of the power factor of electric supply systems." P. R. Coursey and Dubilier Condenser Co. (1925), Ltd. October 30th, 1930. (370,890.)
35,757. "Quick action electric switches." Edison Swan Electric Co., Ltd., and H. E. Lines. December 5th, 1930. (370,920.)
37,263. "Electric discharge devices for the control of energy in electrical circuits." A. Patin. December 10th, 1930. (370,967.)
38,187. "Electric resistance devices." F. S. Smith. December 18th, 1930. (371,012.)

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79. "Radio and other high frequency receivers." Telefunken Ges. für Drahtlose Telegraphie. January 7th, 1930. (370,925.)
246. "Control mechanism for prime movers driving stand-by electric generators." Westinghouse Electric & Manufacturing Co. January 27th, 1930. (370,952.)
369. "Arc welding electrodes." W. W. Groves (E.M.F. Electric Co. Proprietary, Ltd.). January 5th, 1931. (370,897.)
407. "Regulating means for electric circuits." British Thomson-Houston Co., Ltd. January 4th, 1930. (370,970.)
418. "Sound or combined sound and picture recording or reproducing apparatus." International General Electric Co., Inc. January 3rd, 1930. (370,898.)
458. "Arrangement for alternating current relays." S. J. Stage. January 7th, 1930. (370,899.)
568. "System and apparatus for electrically indicating the speed and distance travelled by a ship." W. D. Whyte and N. C. Baird. January 7th, 1931. (370,928.)
705. "Electric frequency meters." Siemens & Halske Akt.-Ges. January 17th, 1930. (371,014.)
838. "Electric controllers for signalling apparatus." British Thomson-Houston Co., Ltd. January 13th, 1930. (370,973.)
976. "Electric furnaces." O. Junker Ges. and Dr. K. Scherzer. January 12th, 1931. (370,903.)
1,006. "Protective system for thermionic valve amplifiers." A. F. Bulgin. January 12th, 1931. (371,018.)
1,074. "Electric regulating systems." British Thomson-Houston Co., Ltd. January 13th, 1930. (371,019.)
1,080. "Modulation of electric oscillators." Associated Telephone & Telegraph Co. February 7th, 1930. (370,912.)
1,133. "Electric circuit interrupters." Westinghouse Electric & Manufacturing Co. January 27th, 1930. (370,980.)
1,139. "Fuses for use in electrical circuits." Standard Telephones & Cables, Ltd. (L. Devaux). January 13th, 1931. (370,938.)
1,202. "Systems for repeating meter readings electrically." Siemens & Halske Akt.-Ges. January 18th, 1930. (371,026.)
1,209. "Removable covers for the spouts or oil-filled enclosures of the isolating contacts of switchgear." D. R. Davies, I. S. Ellis, W. R. Horner, and Associated Electrical Industries, Ltd. January 13th, 1931. (370,959.)
1,216. "Electric battery lamps." General Electric Co., Ltd., and S. W. Richards. January 13th, 1931. (370,981.)
1,340. "Automatic switches for use in telephones or like systems." Automatic Electric Co., Ltd., and R. Taylor. January 14th, 1931. (370,960.)
1,387. "Time-lag overload switches for electric motors." H. J. Norballe. January 15th, 1931. (370,982.)
1,392. "Spring assemblies for switching mechanism having rotary motion." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). January 15th, 1931. (370,983.)
1,525. "Selective transmission of sound waves to microphones." British Acoustic Films, Ltd., and O. K. Kolb. January 16th, 1931. (371,031.)
2,050. "Manufacture of loaded electric cables." Electrical Research Products, Inc., and V. E. Legg. January 21st, 1931. (371,049.)
2,305. "Wound electric condenser and method of manufacturing same." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 15th, 1930. (371,057.)
3,314. "Manufacture of electric condensers." British Thomson-Houston Co., Ltd. February 1st, 1930. (371,072.)
3,687. "Electric ignition systems." British Thomson-Houston Co., Ltd., and L. Griffiths. February 5th, 1931. (371,075.)
4,472. "Gaseous condenser for giving a luminous indication on electrical high tensicn lines." J. Brettmon. February 12th, 1931. (371,082.)
4,585. "Device for maintaining the load current constant in an electric circuit." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 28th, 1930. (371,084.)
4,647. "Electric switches more particularly for use with wireless receivers." J. T. Nickols. February 14th, 1931. (371,085.)
5,934. "Electric metering systems." International General Electric Co., Inc. February 25th, 1930. (371,098.)
6,306. "Electrical selecting arrangements for totalisators." Ericsson Telephones, Ltd., and J. F. T. Engblom. February 28th, 1931. (371,101.)
6,915. "Protective cut-out arrangements for dynamo-electric machines." British Thomson-Houston Co., Ltd. March 5th, 1930. (371,107.)
7,611. "Coil-loaded submarine electric signalling cables." Siemens Bros. & Co., Ltd., and H. G. Wood. March 12th, 1931. (371,118.)
7,950. "Windows for electric discharge tubes for the emission of X-rays or cathode rays." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 25th, 1930. (371,123.)
8,155. "Control apparatus for electric motors." Igranic Electric Co., Ltd., A. H. Mackley, and J. R. Taylor. March 17th, 1931. (371,127.)
9,166. "Manufacture of telephone cables." Telefonaktiebolaget L. M. Ericsson. April 1st, 1930. (371,139.)
10,550. "Electric heating elements for kilns." S. D. White and V. O. Cutts. April 9th, 1931. (371,158.)
10,664. "Stator fed three-phase shunt commutator motors." Siemens-Schuckertwerke Akt.-Ges. April 11th, 1930. (371,159.)
12,094. "Method of electric welding." E. Bornand and H. A. Schlaepfer. May 6th, 1930. (371,165.)
13,028. "Electric lampholders." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 17th, 1930. (371,173.)
14,170. "Apparatus indicating the maximum amplitude of electric potentials." Gaumont-Franco-Film-Aubert. May 19th, 1930. (371,181.)
15,111. "Oil-filled electric cable." C. Cremer and M. Weiset. May 22nd, 1931. (371,194.)
18,634. "Electrical bushing insulators." International General Electrical Co., Inc. June 28th, 1930. (371,216.)
19,903. "Radio receivers." Marconi's Wireless Telegraph Co., Ltd. August 15th, 1930. (371,228.)
20,004. "Electrolytic deposition of silver." Kodak, Ltd. October 22nd, 1929. (Divided application on 31,574/30.) (371,229.)
21,090. "Lighting systems." British Thomson-Houston Co., Ltd. July 23rd, 1930. (371,243.)
22,199. "Electrodes for gas-protected electric arc-welding." International General Electric Co., Inc. August 12th, 1930. (371,249.)
22,983. "Electric cables." Allgemeine Elektricitäts-Ges. August 26th, 1930. (371,258.)
23,917. "Gas-arc torches." British Thomson-Houston Co., Ltd. August 25th, 1930. (371,264.)
23,918. "Gas-arc torches." British Thomson-Houston Co., Ltd. May 25th, 1930. (371,265.)
24,219. "Electric furnaces." Akt.-Ges. Brown Boveri et Cie. September 16th, 1930. (371,266.)
25,345. "Electrical terminal connectors." C. R. Cook. January 16th, 1931. (Divided application on 1,580/31.) (371,035.)
26,959. "High-frequency amplifying circuits." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. October 11th, 1930. (371,275.)
27,563. "Snap action electrical switches of the iron-clad or enclosed type." J. A. Crabtree. December 3rd, 1930. (Divided application on 36,402/30.) (370,945.)
30,202. "Process for insulation of the cells in galvanic batteries." A. B. Harje. October 31st, 1931. (371,289.)
31,815. "Contact-breakers for electric ignition apparatus." R. Bosch Akt.-Ges. November 28th, 1930. (371,295.)
33,316. "Sparking plugs for internal combustion engines." A. Kegresse. December 6th, 1930. (Addition 351,340.) (371,299.)
34,421. "High-speed electric machines." International General Electric Co., Inc. December 13th, 1930. (371,303.)

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5,441. "Tool for joining wires by rolling." Western Electric Co., Ltd. (Bell Telephone Laboratories Inc.). January 13th, 1931. (Divided application on 371,022.) (370,961.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from May 4th.

C. H. C. Midas (lettering and design). No. 528,303. Class 6. Cinematograph motors and film rewinding machines. No. 528,304. Class 8. Accumulators, rheostats, &c., for use in cinematography.—Cam Syndicate, Ltd., 46, Basinghall Street, E.C.2.

Breeza. No. 527,075. Class 6. Electric fans for ventilating purposes.—The London Fan & Motor Co., Ltd., 81, Charlotte Street, W.1.

Armordite. No. 529,786. Class 8. Electric cables.—Armorduct Cable Co., Ltd., 159, Westminster Bridge Road, S.E.1.

Supex. No. 530,434. Class 8. Electric batteries and accumulators (not for medical purposes) and wireless telephonic apparatus.—B.B., Ltd., 236, Oxford Street, Swansea.

Atlas and Globe (design only). No. 529,914. Class 8. Coils, variometers, variable and fixed electric condensers, rheostats, &c., all being component parts of wireless telephonic apparatus.—H. Clarke & Co. (Manchester), Ltd., Atlas Works, Eastnor Street, Old Trafford, Manchester.

Brook Radio (lettering and design). No. 530,460. Class 8. Wireless telephonic receiving apparatus.—The Brook Radio Co., Ltd., 68, Blandford Street, W.1.

Unirad. No. 530,491. Class 8. Wireless telephonic and telegraphic receiving and transmitting apparatus and their parts, telephones, loud speakers, electric transformers, condensers, and television apparatus and parts thereof.—Union Radio Co., Ltd., U.R. Works, 15a, Campbell Road, Croydon.

Solfa. No. 530,571. Class 8. Wireless telegraphic, telephonic and television apparatus.—Francis Edgar Powell, trading as the Double Diamond Radio Co., "Estoril," 81, Old Ford Road, Shoreham, Sussex.

Adoloy. No. 529,835. Class 12. Hand tools with a cutting edge.—The British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.

Edolite. No. 528,873. Class 13. Electric lamps (ordinary).—Eddystone Components, Ltd., 13, Mincing Lane, Blackburn.

Rima. No. 529,546. Class 13. Electric lamps (ordinary).—B.I.M., Ltd., Roden Street, Ilford, Essex.

Mobilux. No. 530,866. All goods in Class 13.—The Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, N.17.

Suspending Insulator Chains Without Cement

In a recent issue of our Italian contemporary *L'Elettrotechnica* Signor A. Picchi describes a method of suspending insulator chains in power transmission lines without the use of cement, devised by him in conjunction with Signor Benedetti. It is claimed that the new system offers the necessary mechanical strength and possesses the advantage that the elements of the chain can be easily taken apart and reassembled. It is stated that a chain of nine elements built up in accordance with the Picchi-Benedetti system has been tested under rain and has withstood 400 kV, as against only 320 kV with an ordinary chain of insulators tested under similar conditions.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Premises for the Northern Co-operative Society, 54, Loch Street; Tawse & Allan, architects, 10, Bon Accord Square.

Bacup.—Houses (50); borough engineer, Town Hall.

Barnard Castle.—Banking premises; Architects' Department, Yorkshire Penny Bank, Ltd., Infirmary Street, Leeds.

Barnsley.—Equipment for mining and technical college (£17,916) for the Borough E.C.; clerk.

Bebington and Bromborough.—Houses (50), Beaconsfield Road Estate; U.D.C. surveyor.

Bideford (DEVON).—Houses (42), Sentry Corner; borough surveyor. North Devon Isolation Hospital; F. E. Whiting, architect, 21, High Street.

Birmingham.—Coronet Cinema, Coventry Road, Small Heath; Satchwell & Roberts, architects, 6, New Street.

Blyth.—Infants' school, Princess Louise Road; U.D.C. surveyor, L. Leeper, Town Hall.

Bromley (KENT).—Houses (135), Widmore Road, for H. F. Thorburn, Ltd. Houses (54), off Southborough Road, for C. H. Morrell.

Bury.—Schools, Fishpool (£9,500), and Fell Street and Stephen Street, Elton; director of education, Education Offices.

Carlisle.—Elementary school (120 places), Blackwell Road and Leabourns Lea Currock Housing Estate; F. A. Coyle, architect, 29, Newmarket Street, Consett, Co. Durham. Bus station, Lowther Street; C. D. Quinn, architect, Ribble Motor Services, Ltd., Frenchwood Avenue, Preston.

Cheshunt.—Houses (24), Pond Park Estate; U.D.C. surveyor.

Chesterfield.—Extensions to Highfield and Hasland schools (£8,400); Education Committee.

Colchester.—Houses (106), Ipswich Road; borough engineer.

Cowes.—Houses (20); U.D.C. surveyor.

Cromarty.—Restoration after fire of Stewart Memorial Church; John Wittet, architect, Torr House, Elgin.

Croydon.—St. George's Church, Waddon; W. Curtis, Green & Partners, architects, London; C. H. Gibson, Ltd., builders.

Darlington.—Town planning scheme at Whessoe, Hurworth, Morton Palm, and Bickwell; E. Minors, borough engineer, Town Hall.

Dartford.—Houses (22), Rosebery Gardens; W. G. Cooper. Houses, Swanley Junction (42), Darenth (34), and Southfleet (26), for the R.D.C.; E. J. Hobbs, clerk, West Hill.

Dollis Hill (MIDDLESEX).—R.C. church; F. J. Bradford, 1, Leamington Street, Leicester.

Doncaster.—Extensions, Intake school (£10,000), for the borough E.C.; education architect.

Donisthorpe.—Houses (30); Mr. Cook, R.D.C. surveyor.

Dudley.—Houses (68), Priory Estate; borough engineer. Hotel, Holly Hall, Wolverhampton and Dudley Breweries. Re-erection of factory, electrically equipped, Dudley's Row, Hall Street, for Baugh Bros.

Durham.—Houses (143) at Sherburn Hill (£53,000); R.D.C. surveyor, Council Offices. School, Shotton, and sanatorium (£125,000), Aycliffe; county architect, 43, Old Elvet, Durham.

Eastry (KENT).—Houses (20); R.D.C. surveyor.

East Wickham (KENT).—Church (£11,000); Chapman, Lowry & Puttock, builders, Station Road, Haslemere.

Edinburgh.—Houses (44) for C. H. Dunlop; C. E. Tweedie & Sons, architects, 54, Frederick Street. Granton Mains housing scheme (202 houses) for Corporation; city architect.

Erith.—School, Bostall Heath, for the E.C.; director of education.

Essex.—School (480 places), Timberlog Lane, Pitsea; county E.C. Senior school, Manningtree; director of education, Chelmsford.

Felling-on-Tyne.—Houses (118) for the U.D.C.; C. W. Hall, architect, Council Offices.

Gateshead-on-Tyne.—Houses (430); F. P. Pattersen, borough engineer, Town Hall.

Gillingham.—Houses (32), Osprey and other roads; F. T. Mattocks. Pumping station; borough engineer. Houses (136), Roots Estate; borough engineer.

Glasgow.—Houses (1,500); Corporation Housing Department. Reconstruction of Lyceum Theatre, Govan (floodlighting, &c.); the manager. Extensions to Hawkhead Mental Hospital; city architect.

Godalming (SURREY).—Houses (20), Eashing Lane site; borough surveyor.

Hartshorne and Seals.—Houses (88); R.D.C. surveyor.

Haslingden.—Covered market off Bury Road; borough surveyor.

Hayes (MIDDLESEX).—Houses (74), Hayes Bridge Estate; Gradwell & Co., Hindpool Saw Mills, Barrow-in-Furness.

Hertfordshire.—Schools, Manland Common, Harpenden, Pathway, and Welwyn Garden City, near St. Albans; county E.C.

Houghton-le-Spring.—Houses (75); V. J. Hunter, U.D.C. surveyor, Council Offices.

Hull.—Houses (22), East Hill Estate; city architect. Nurses' home and mental hospital (£34,000); Robinson & Sawdon. Ltd., Hull.

Ilfracombe.—Secondary school; director of education, Exeter.

Irish Free State.—(DUBLIN).—School (400 places), Bloomfield Avenue, South Circular Road, Dublin, for Rabbi Dr. I. Herzog; Beckett & Medcalf, quantity surveyor, 6, Clare Street, Dublin. (ENNISTYMON, Co. CLARE).—District hospital, for the County Board of Health; Mitchell & Sons, architects, 6, Merrion Square, North, Dublin, and Bindon Street, Ennis, Co. Clare.

Keighley.—Houses (20) and shops (2), Devonshire Street; Waterhouse & Pickles.

Kingswood, Holsworthy.—Methodist Church and school; Rev. I. Leaver, The Manse, Hatherleigh, Devon.

Langport (SOMERSET).—Milk process factory, Thorney, Muchelney, for Nestlé and the Anglo-Swiss Condensed Milk Co., Ltd., 6, Eastcheap, London, E.C.

Leeds.—Houses (82) and flats (112), Torre Estate; city engineer. Houses (265), Halton; Sutton Dwellings Trust.

London.—(POPLAR).—Tenements, Bow Brewery site (£22,150); Rowley Bros., Ltd., Tottenham. (WALTHAMSTOW).—Municipal buildings, for the T.C.; P. D. Hepworth, architect, Gray's Inn Place, Gray's Inn, London. (DULWICH).—Extensions, Poor Law Institution (£9,670); H. & J. Taylor, Hither Green.

Longton (STAFFS).—Re-erection, Borough Pottery (£20,000); proprietors.

Manchester.—Christian Science church, Levenhulme; Davidson, Son & Sherwood, 32, Clayton Street, Newcastle-on-Tyne.

Musselburgh.—Houses (116), for T.C.; John Logan, borough surveyor, Town Hall.

Neath (GLAM).—Senior school (200 places); J. Cook Rees, architect, Parade Chambers.

Newburn-on-Tyne.—Housing scheme at Throckley; U.D.C. surveyor, Council Offices.

Newcastle-on-Tyne.—Factory, for Messrs. Sinton & Baxter; Glass, Harrison & Ash, 20, Saville Row. Premises in Prudhoe Street for the P.C.H.A. (£30,000); J. & R. Rutherford & Sons, builders, Minories Joinery Works, Jesmond, Newcastle. Workshops for the blind (£29,000); city engineer.

Newport (MON).—Reconstruction, Tredegar Whard School (£11,600); Education Committee.

North Shields.—Extensive alterations to the Theatre Royal (including installation of sound reproducing apparatus); Atkinson & Browell, Consett, Durham.

Northumberland.—School, Shiremoor, and installation of electric lighting at the Ashington Bothal Council School and the Bedlington Infants' School; W. W. Tasker, county architect, 17, Claremount Road, Newcastle.

Norwich.—Municipal offices, for the T.C.; S. Roland Pierce, architect, 15, Gower Street, London, W.C.

Oldbury.—School, Bleakhouse, for the E.C.; director of education.

Pulborough (SUSSEX).—R.C. church; priest-in-charge.

Ramsgate.—School (£21,690), for the Borough E.C.

Rawdon (YORKS).—Licensed premises, junction of Canada Road and Harrogate Road; M. Yeadon & Sons, builders, Whackhouse Yeadon, near Leeds.

Reading.—Employment exchange; H.M. Office of Works, King Charles Street, London, S.W.

Ross & Cromarty.—School, Dingwall, for the County E.C.; director of education, Dingwall.

Seaham Harbour.—Houses (100); J. Barwick-Abbey, surveyor, Council Offices.

Sheffield.—Houses, Shiregreen Estate (£15,430); Simms, Sons and Cooke, Ltd. Houses, Shiregreen (£14,700); G. & C. Whittle, Ltd. Houses, Shiregreen Estate (£51,158); M. J. Gleeson, Ltd. Houses (552), Woodthorpe Estate; city architect. Houses (100), by direct labour, Totley Estate; city architect. Houses (38), Sittington View Road; Miss I. M. Helliwell.

Shoreham (SUSSEX).—Houses (90); U.D.C. surveyor.

Southall.—Houses (24), Tentelow Road; A. E. Talbot. Houses (42), Rutland Road and Devonshire Road (32); Wimpey & Co., The Grove, Hammersmith, W.6. Factory extensions, Scotts Road; T. G. Tickler, Ltd.

Southampton.—Town hall, for the T.C.; E. Berry Webber, architect, 2, New Square, London, W.C.

South Moor (DURHAM).—R.C. Church, Hustle Down; Kindred and Co., Westacre, St. Anthony's, Newcastle-on-Tyne.

South Shields.—Houses (96), for the T.C.; W. D. Allison and Son, builders, Whitburn Village.

South Stoneham (HANTS).—St. Alban's Church (£13,000); incumbent.

Stockton-on-Tees.—Houses (20), on the Blue Hall Estate; J. P. Wakeford, borough engineer, Town Hall.

Stratford-on-Avon.—Houses (26); R.D.C. surveyor.

Sunderland.—Improvements and extensions to Wheatsheaf Hotel, Monkwearmouth; Gourlay & Morgan, builders, Shields Road, Newcastle-on-Tyne. Houses (20), Bainbridge Holme Estate; G. T. Brown, architect, 51, Fawcett Street, Sunderland.

Sutton.—School, Ridge Road (£6,452); J. Billings & Co., Ltd.

Sutton Coldfield.—Houses (62), Rectory Estate; Biddle and Homer. Houses (450), Maney Hill Estate; estate trustees.

Swadlincote.—Houses (124); U.D.C. surveyor.

Thornaby-on-Tees.—Extensions to Messrs. Pumphrey & Co.'s sugar mills; A. McLeod, builder, Thornaby.

Tipton (STAFFS).—Public baths (£25,000), for the U.D.C.; Mr. Coulson, builder.

Torquay.—School, Ellacombe; town clerk. Cinema, Castle Circus; Associated British Cinemas, Ltd.

Twickenham.—Houses (118), Forty Acre Field; borough surveyor.

Tynemouth.—Houses (301), for T.C., Silky Lane; W. E. Hall and Son, Ltd., builders, 29, Durham Road, Low Fell, Gateshead.

Wakefield.—Municipal Hospital, Snapethorpe; L. Ives, city surveyor, Town Hall. Development of Belle Vue Estate for houses; Charles F. Napper, builder, 13, Albert Street, Harrogate. Houses (56), Agbrigg & Doncaster Roads; C. F. Napper. Houses (123), Eastmoor Estate and Brunswick Street; city architect.

Wallsend-on-Tyne.—Housing scheme on East side of Station Road; J. Blench, borough engineer, Town Hall.

West Bromwich.—School, Friar Park; A. O. Chatterley, architect, 16, Pembroke Road, Liverpool.

Whipsnade (BEDS).—Rebuilding Chequers Inn, for Benskin's Watford Brewery, Ltd., High Street, Watford; company's architect.

Wolverhampton.—Houses (108), Bushberry Hill Estate (£30,636); A. M. Griffiths & Son, Ltd., Thomas Street.

Worthing.—Development of building estate; Offington Drive; Mr. Peppiatt.